Federal Aviation Administration

NAS Enterprise Architecture

Infrastructure Roadmaps v14.0

BASELINE

January 2020

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Infrastructure Roadmap Overview

What are the Infrastructure Roadmaps?

- The FAA Infrastructure Roadmaps show the progression of system deployments, investments, and key decision points for major NAS acquisitions. They depict the acquisition strategy to evolve the NAS from the As-Is to the To-Be environment.
- The Infrastructure Roadmaps show all Capital Investment Plan (CIP) investment projects and systems identified in the NSIP that will deliver the necessary functionality to enable OIs and BTIs.

What's new in Version 14.0?

- See Appendix B: Change History for domain-specific changes

Guidelines for Understanding the Roadmaps

- The Infrastructure Roadmaps are organized by Domain (Automation, Communication, etc.) and depict projects, systems, services, decision points, and support activities.
- The timeline is in calendar years and shows a 15-year outlook.
- The roadmaps have swim lanes for infrastructure (white) and Support Activities (green).
- The DP diamonds represent the quarter in which a decision will occur.
- The Support Activity bars represent the dates that work is being performed on the activity.
- The Project bars represent the dates that CIP funding is allocated to a project.
- The System and Service bars represent the dates that a system or service is operational, with red lines indicating sustainment, drawdown, or convergence.

Infrastructure Roadmaps Legend

Roadmap Legend

2019 | 2020 | 2021 — **Timeline**

XYZ — **System / Service / Support Activity**

XYZ — **Support Activity Owned by Another Domain**

XYZ — **Project**

XYZ — **Planned (Unfunded) System/Service/Project***

XYZ — **NextGen Project (denoted by G CIP number)**

XYZ — **Operational Node / Procedure / Capability / Other Architecture Object**

XYZ — **Facility Type**

X — **Decommission**

→ **System successor**

⇢ **System in Draw-Down Mode**

Decision Point Fill Colors

FID ### — **AMS (CRDR, IARD, IID, FID, BCD)**

— **Policy**

— **Strategy (JRC)**

— **Strategy (Other)**

— **Decision Point Owned by Another Roadmap**

— **Regulatory Milestone**

Decision Point Borders**

— **Future Baselined DP; High Priority**

— **Future Baselined DP; Non-High Priority**

or ### — **Completed DP**

or ### — **Planning DP**

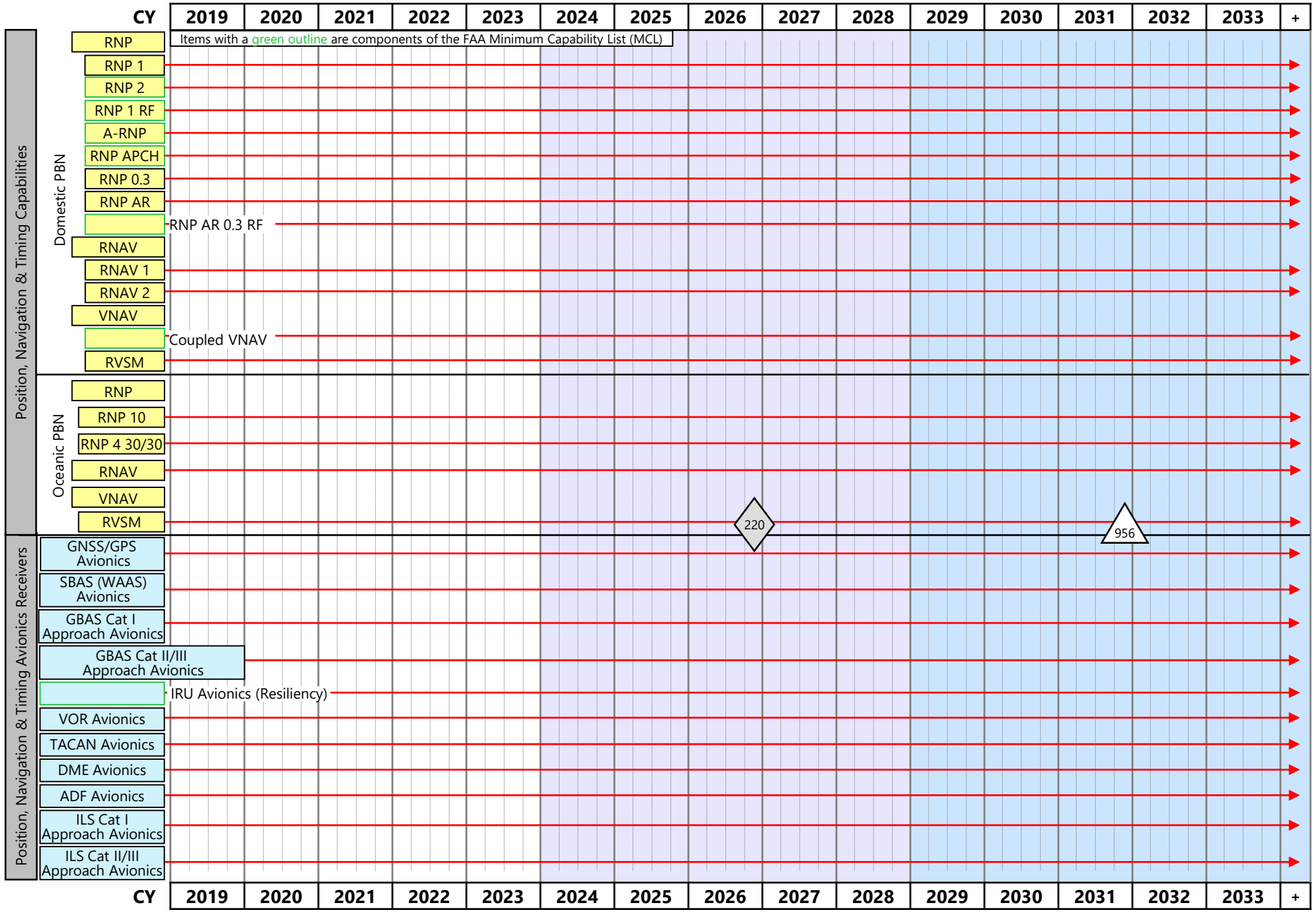
* Applies to any fill color type

** Applies to any Decision Point fill color type

Aircraft

Objective: The Aircraft roadmap presents planned advances in Airframe and Avionics in coordination with NAS NextGen improvements.

Aircraft Roadmap (1 of 7)



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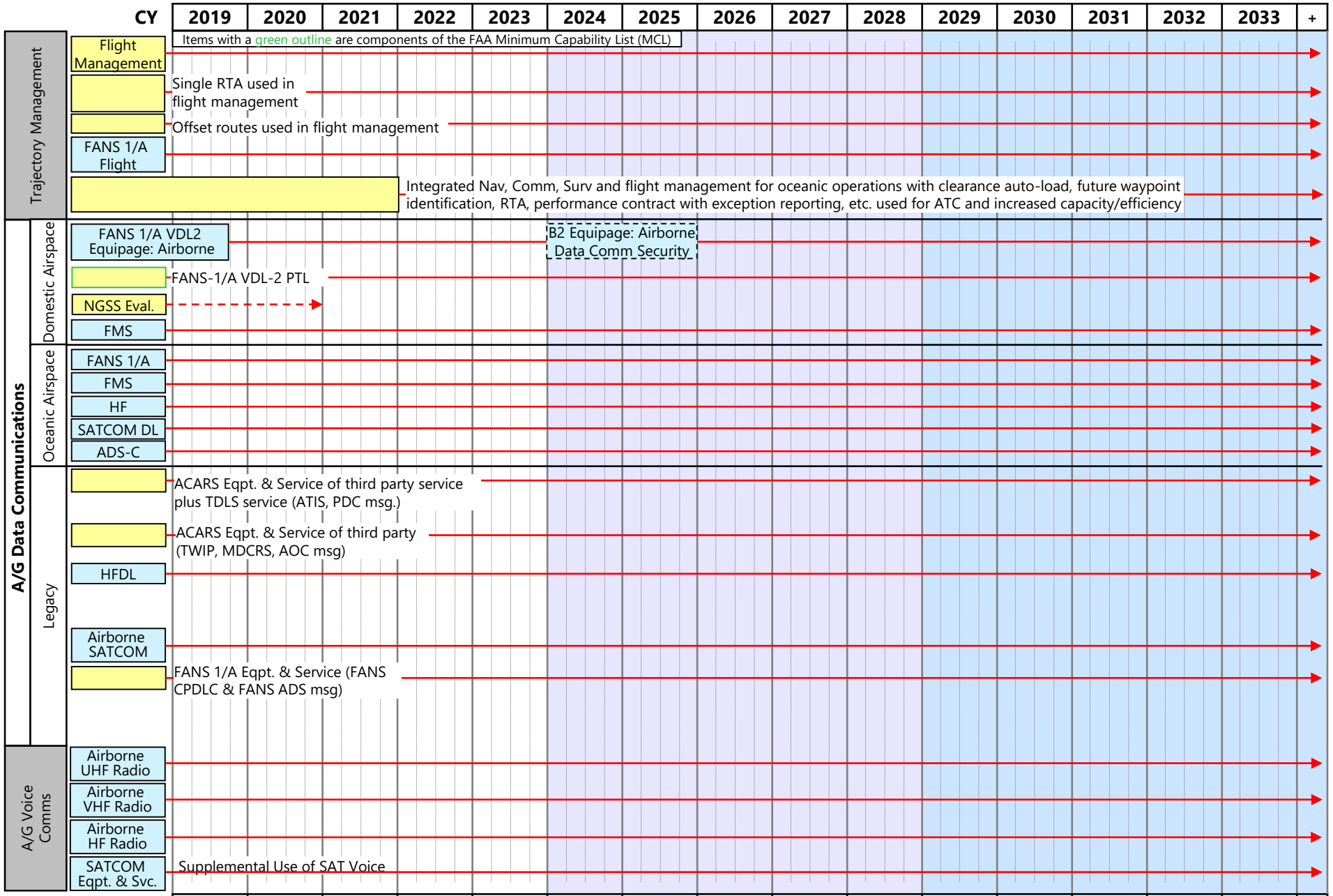
Aircraft Roadmap (2 of 7)



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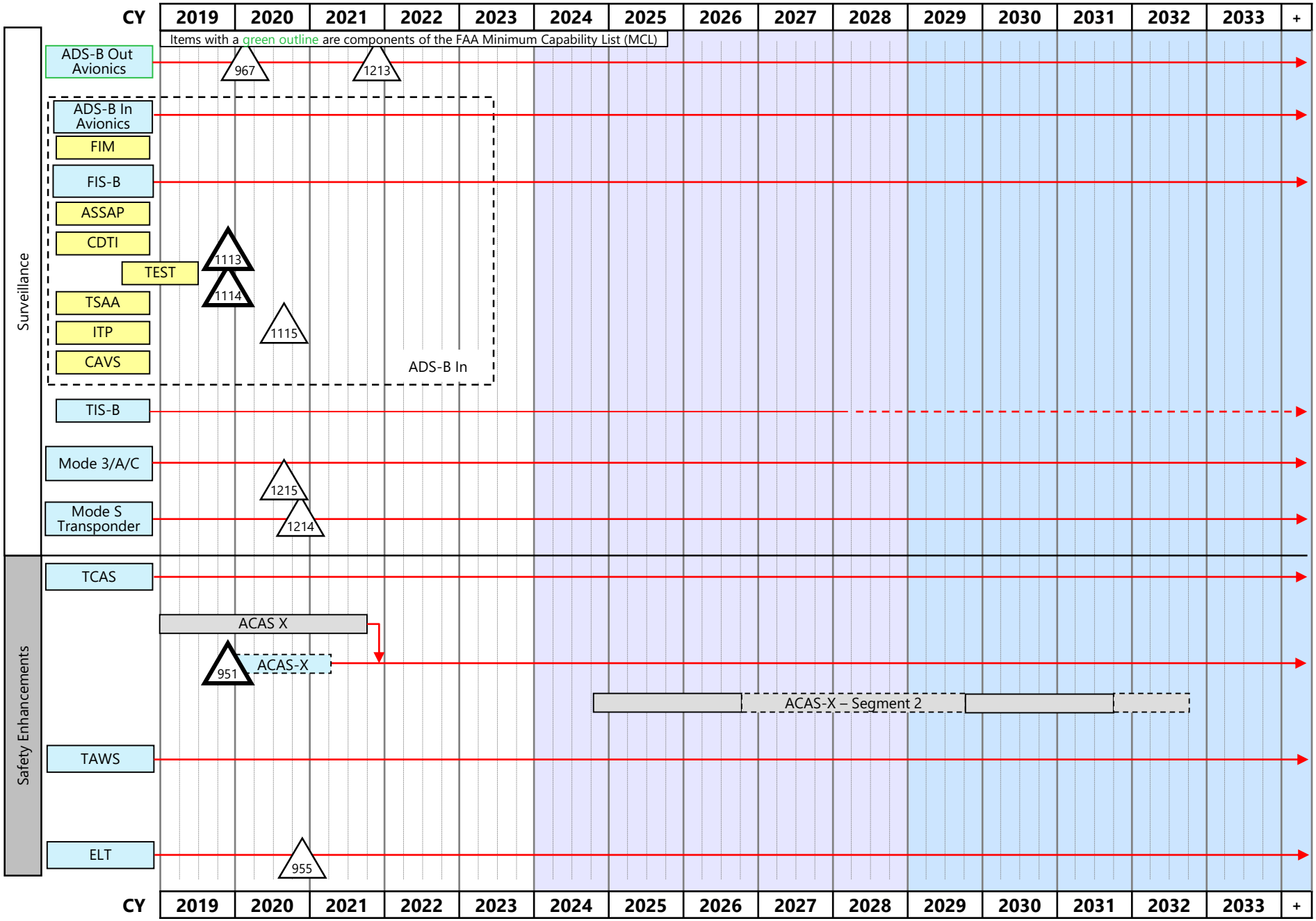
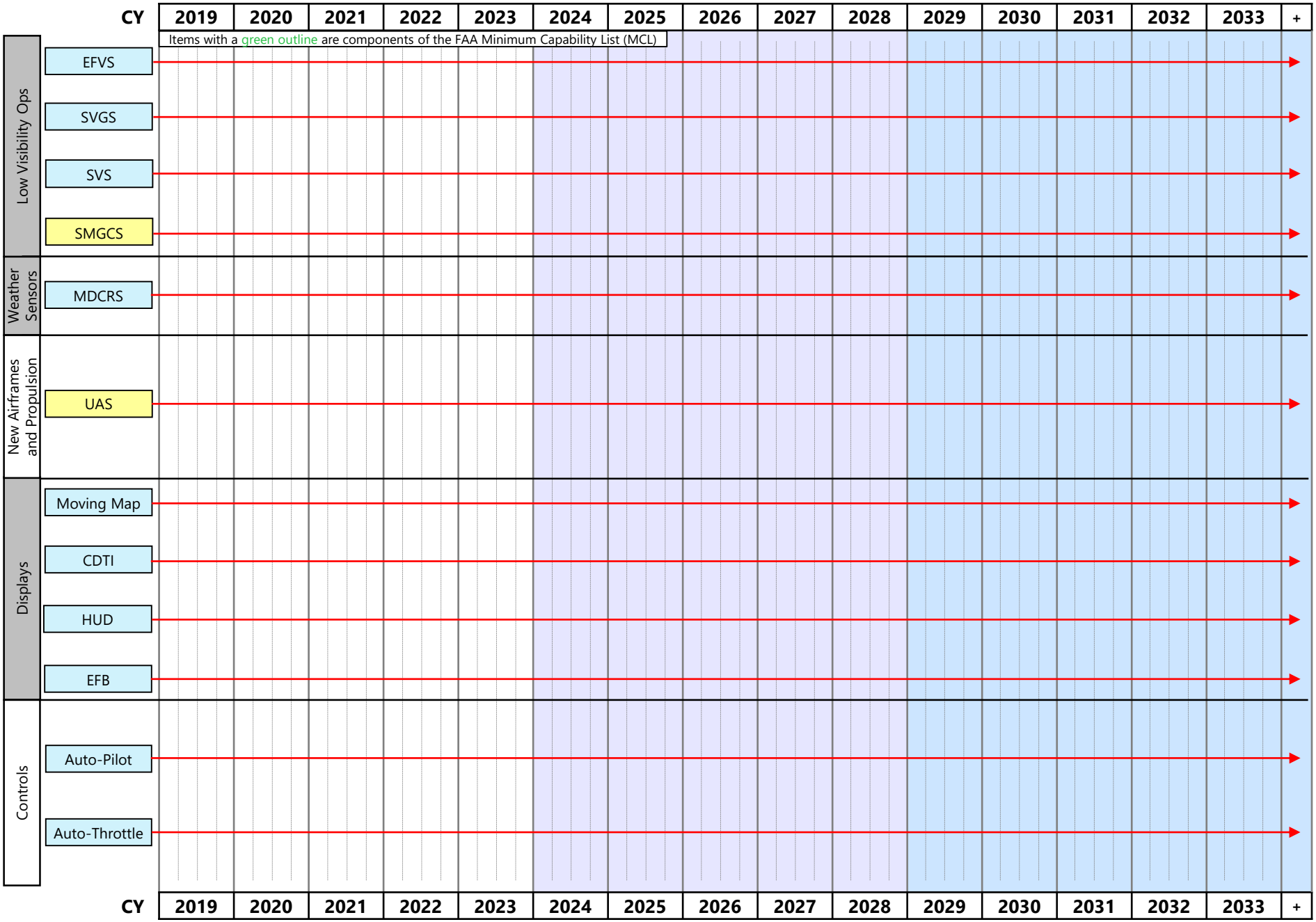
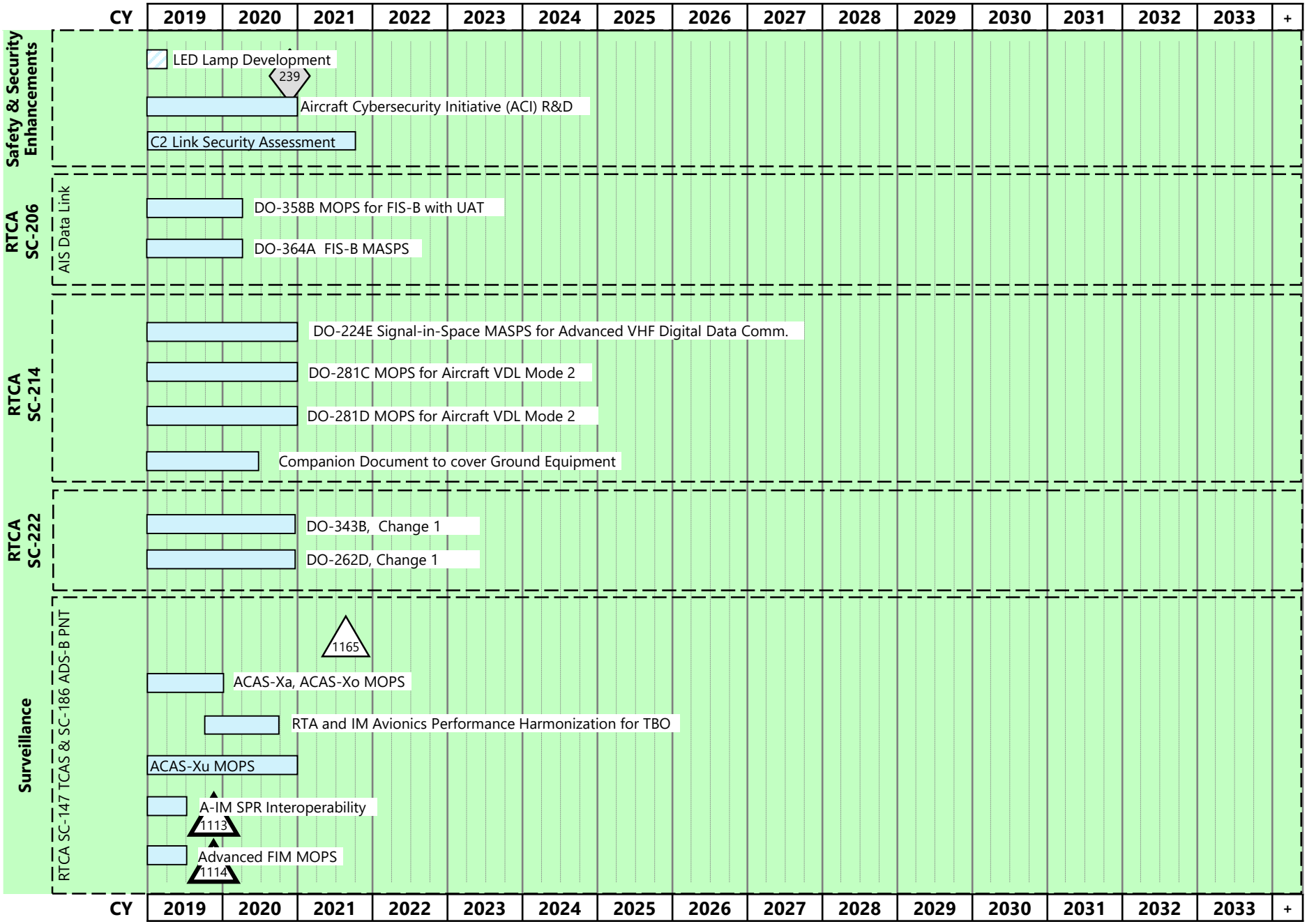
Aircraft Roadmap (3 of 7)



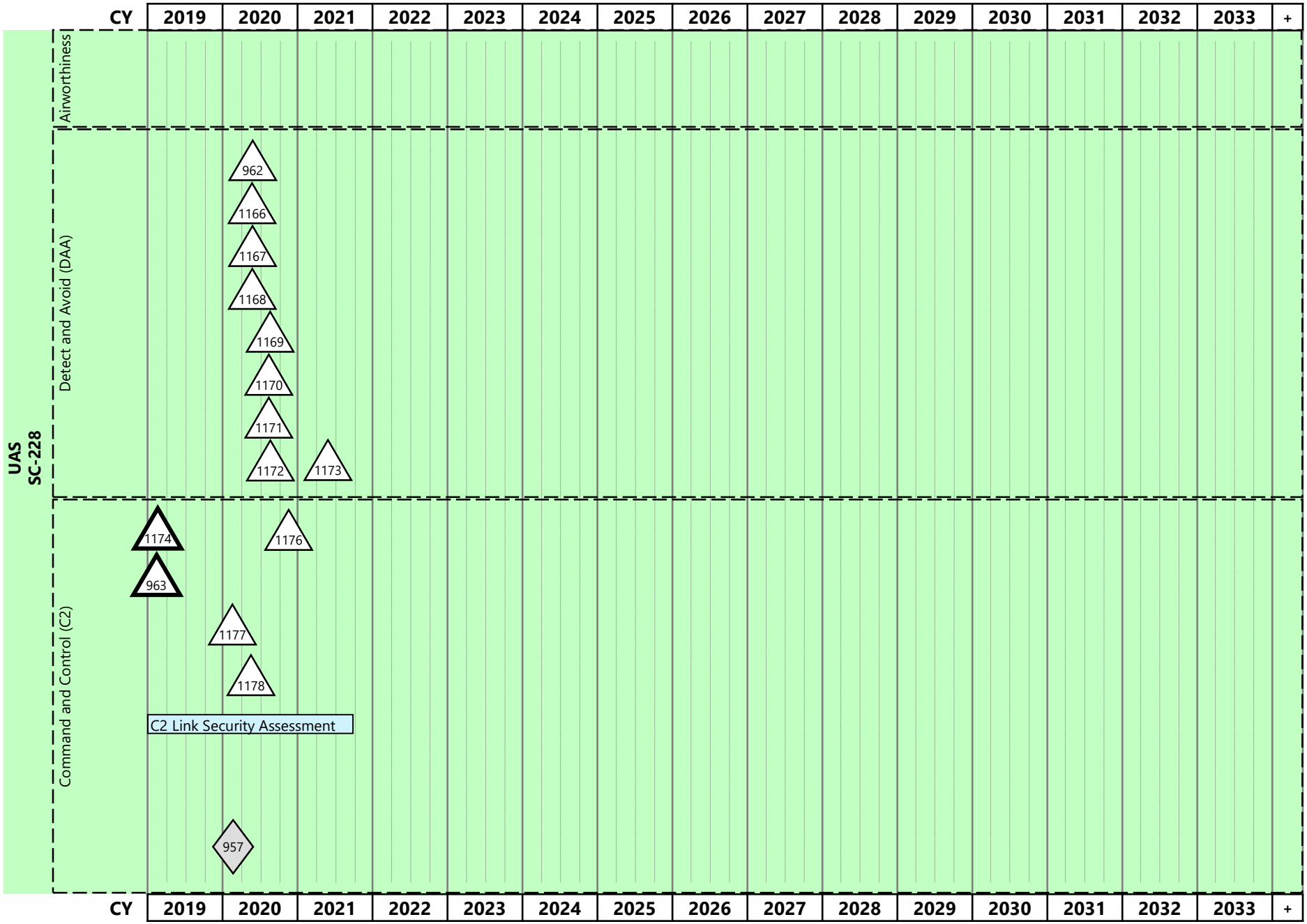
Aircraft Roadmap (4 of 7)



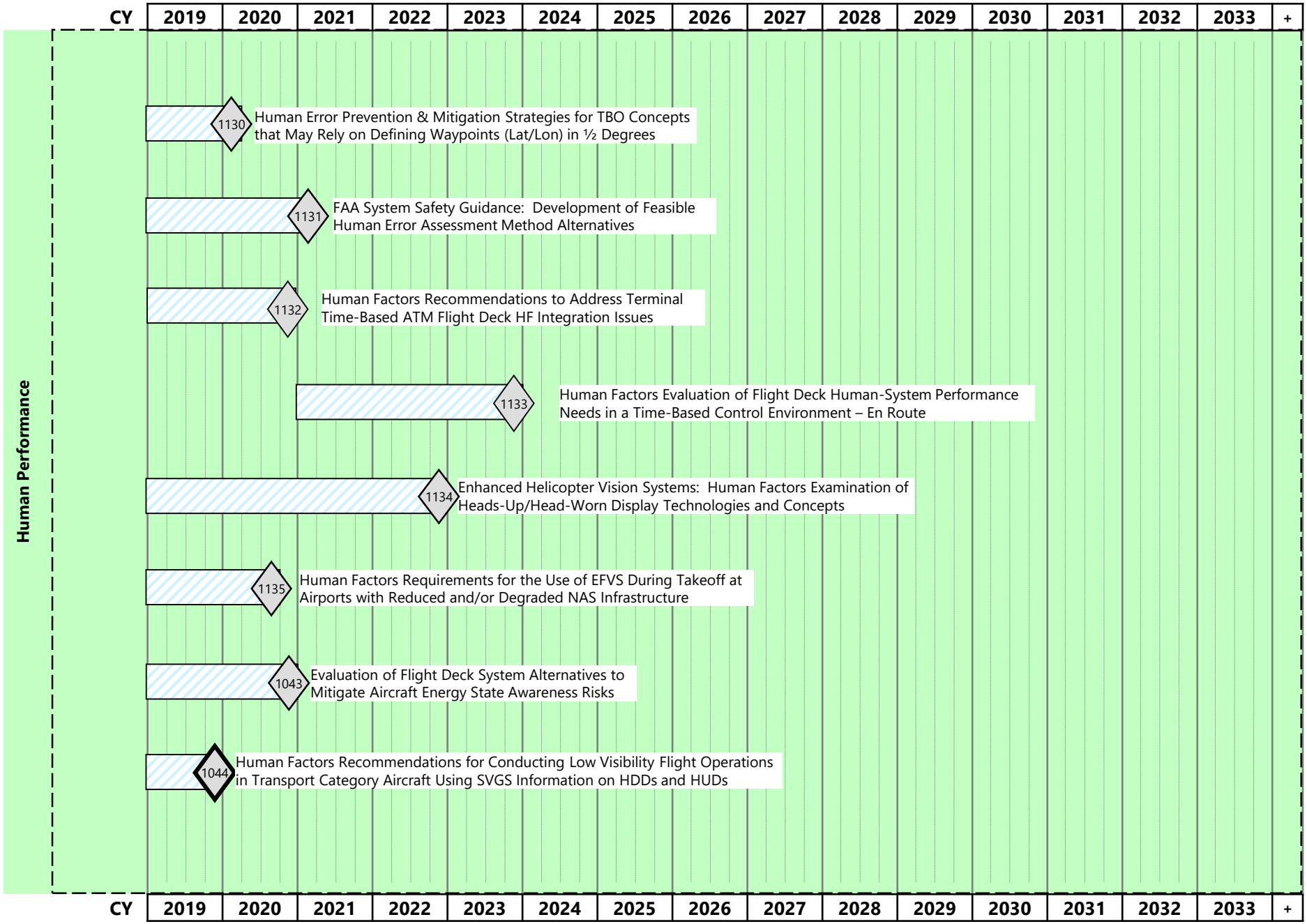
Aircraft Roadmap (5 of 7)



Aircraft Roadmap (6 of 7)



Aircraft Roadmap (7 of 7)



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Aircraft Roadmap: Assumptions

Identifier	Description
AC-01	The roadmap identifies four phases a) CONOPs development and R&D in required areas b) Standards development c) AVS Approval d) ATC Procedure development e) Deployment. After the standards process is complete, and manufacturers have developed, integrated, fully tested and made new avionics available, aircraft, engines and fuels available, an additional 7 to 10 years is needed to achieve wide scale equipage of a new capability 1. Different aircraft are expected to equip with different equipment. This roadmap does not currently distinguish between aircraft types.
AC-02	The aircraft roadmap includes environment research areas and assumptions and linkage to Mission Support EA.
AC-03	Any aircraft to include any UAS that participates in the NAS must operate in a way that is transparent to the ANSP and ATSP.
AC-04	The Minimum Capability (MCL) items documented in the Aircraft roadmap are accurate as of the September 2019 draft of the MCL.

Aircraft Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
220	2026 Q4	No	Navigation	Strategy (Other)	Decision to Cut Over to Dual Frequency / Multi-Constellation Operations Based on Completion of Dual Frequency (GPS L1 and L5) Development & Testing
239	2020 Q4	No	Navigation	Strategy (Other)	Strategy Decision to Proceed with ALS (I) Production LED Lamps for MALSR Systems
951	2019 Q4	No	Aircraft	Regulatory Milestone	TSO ACAS-Xa/Xo
955	2020 Q4	No	Aircraft	Regulatory Milestone	TSO-C126c: Emergency Locator Transmitter (ELT)
956	2031 Q4	No	Aircraft	Regulatory Milestone	Publication of SBAS Dual-Frequency/Multi-Constellation (DFMC) MOPS
957	2020 Q1	No	New Entrants - UAS	Strategy (Other)	C2 Protected Spectrum Management and Allocation Systems Acquisition Strategy Determined
962	2020 Q2	No	Aircraft	Regulatory Milestone	Minimum Operational Performance Standards (MOPS) for UAS Detect and Avoid (DAA) - Phase 2 (SC-228)
963	2019 Q1	No	Aircraft	Regulatory Milestone	Advisory Circular (AC) Invoked for Command and Control for UAS Operations
967	2020 Q1	No	Aircraft	Regulatory Milestone	ADS-B Out Equipage Rule Implemented
1043	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval & Implementation Strategy of Human Factors Aircraft Energy State Display and Alerting Guidelines
1044	2019 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors SVGS Guidelines
1113	2019 Q4	No	Aircraft	Regulatory Milestone	Advanced FIM SPR Interoperability
1114	2019 Q4	No	Aircraft	Regulatory Milestone	Advanced FIM MOPS
1115	2020 Q3	No	Aircraft	Regulatory Milestone	Revisions to ADS-B 1090ES MOPS
1130	2020 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval & Implementation Strategy of HF Guidance for the Presentation of ½ Degree Waypoints to Users
1131	2021 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors System Safety Guidance
1132	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Mid-Term Time-Based ATM Enhancements
1133	2023 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Far-Term Time-Based ATM Enhancements
1134	2022 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Helicopter Advanced Vision Systems
1135	2020 Q3	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for the Use of EFVS During Departure Operations
1165	2021 Q3	No	Aircraft	Regulatory Milestone	TSO ACAS-Xu

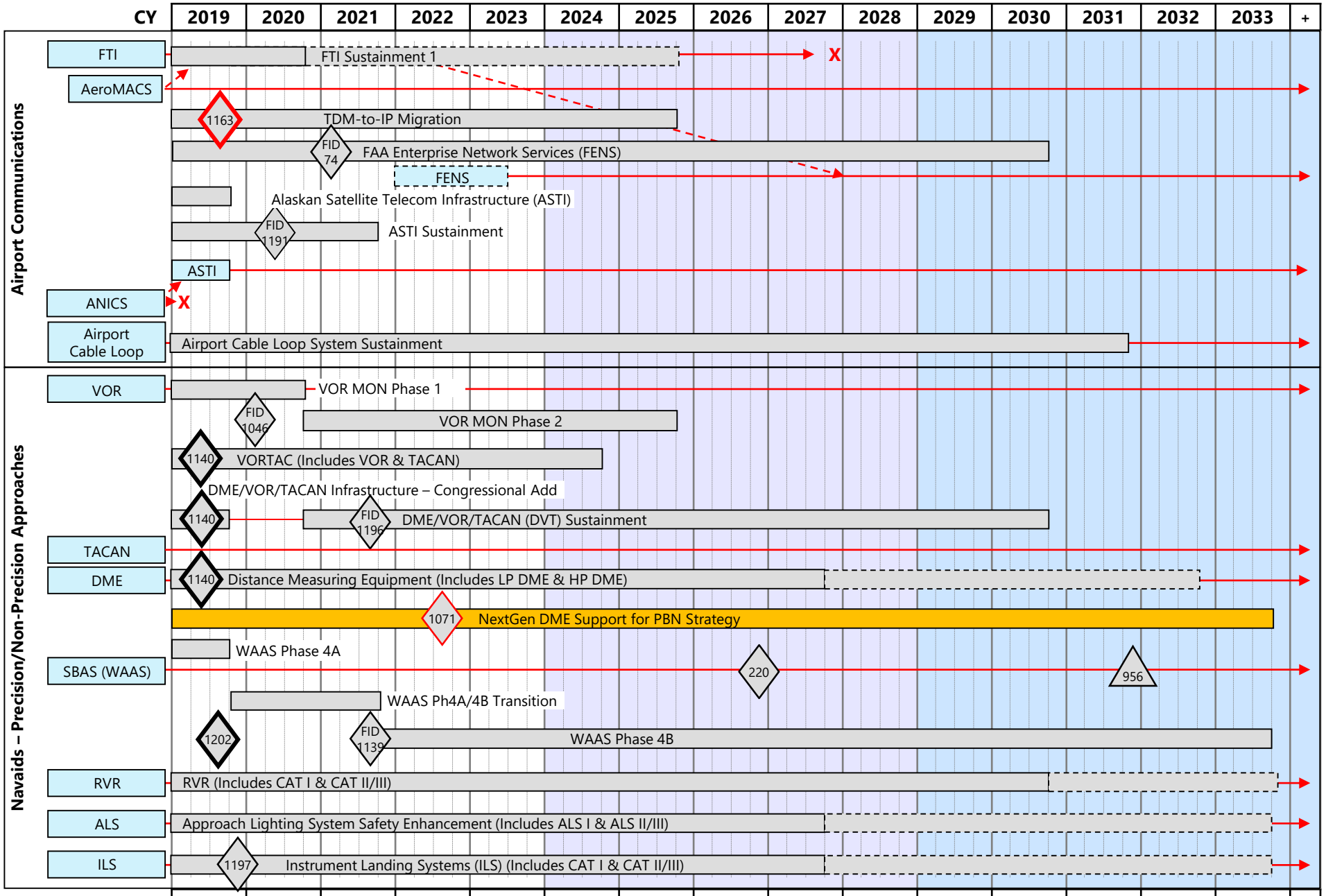
Aircraft Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1166	2020 Q2	No	Aircraft	Regulatory Milestone	Ground Based Surveillance MOPS
1167	2020 Q2	No	Aircraft	Regulatory Milestone	Rev A to DAA MOPS DO-365
1168	2020 Q2	No	Aircraft	Regulatory Milestone	TSO-C211, Rev A (Ground-Based Surveillance and Terminal WC)
1169	2020 Q3	No	Aircraft	Regulatory Milestone	Non-Coop Sensor (EO/IR) MOPS
1170	2020 Q3	No	Aircraft	Regulatory Milestone	Airborne EO/IR Sensor MOPS
1171	2020 Q3	No	Aircraft	Regulatory Milestone	ATAR MOPS, DO-366, Rev A
1172	2020 Q3	No	Aircraft	Regulatory Milestone	DAA MOPS, DO-365, Rev B
1173	2021 Q2	No	Aircraft	Regulatory Milestone	TSO for EO/IR
1176	2020 Q4	No	Aircraft	Regulatory Milestone	C2 Link System MASPS, Rev A
1177	2020 Q1	No	Aircraft	Regulatory Milestone	DO-377 C2 link MASPS
1178	2020 Q2	No	Aircraft	Regulatory Milestone	CNPC MOPS, DO-362A
1213	2021 Q4	No	Aircraft	Regulatory Milestone	Revisions to ADS-B UAT MOPS
1214	2020 Q4	No	Aircraft	Regulatory Milestone	Revisions to Mode S Transponder MOPS
1215	2020 Q3	No	Aircraft	Regulatory Milestone	Revisions to Transponder MOPS, DO-181E

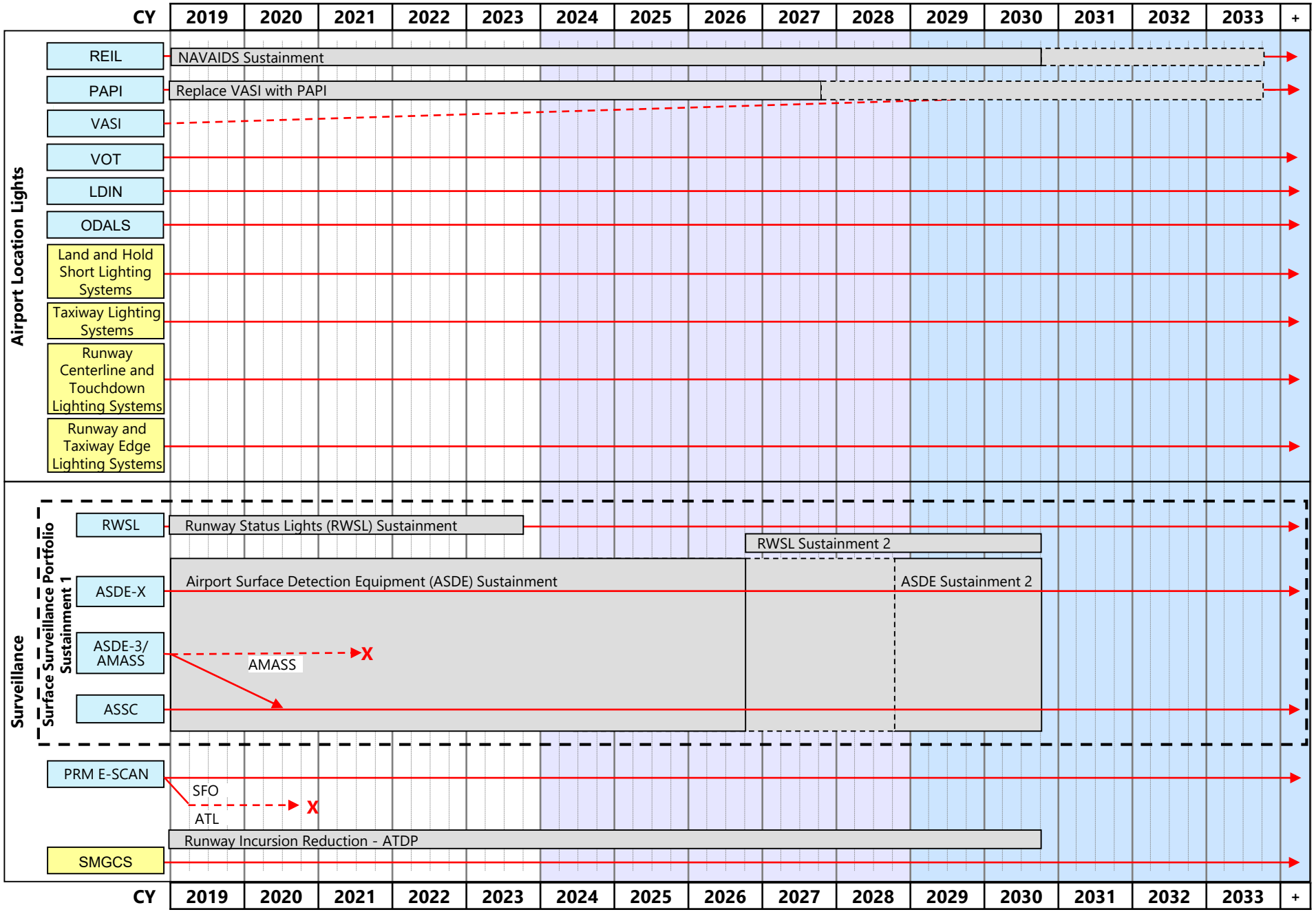
Airport

Objective: The Airport Roadmap identifies NextGen progression of services, procedures and systems in the airport environment.

Airport Roadmap (1 of 5)



Airport Roadmap (2 of 5)



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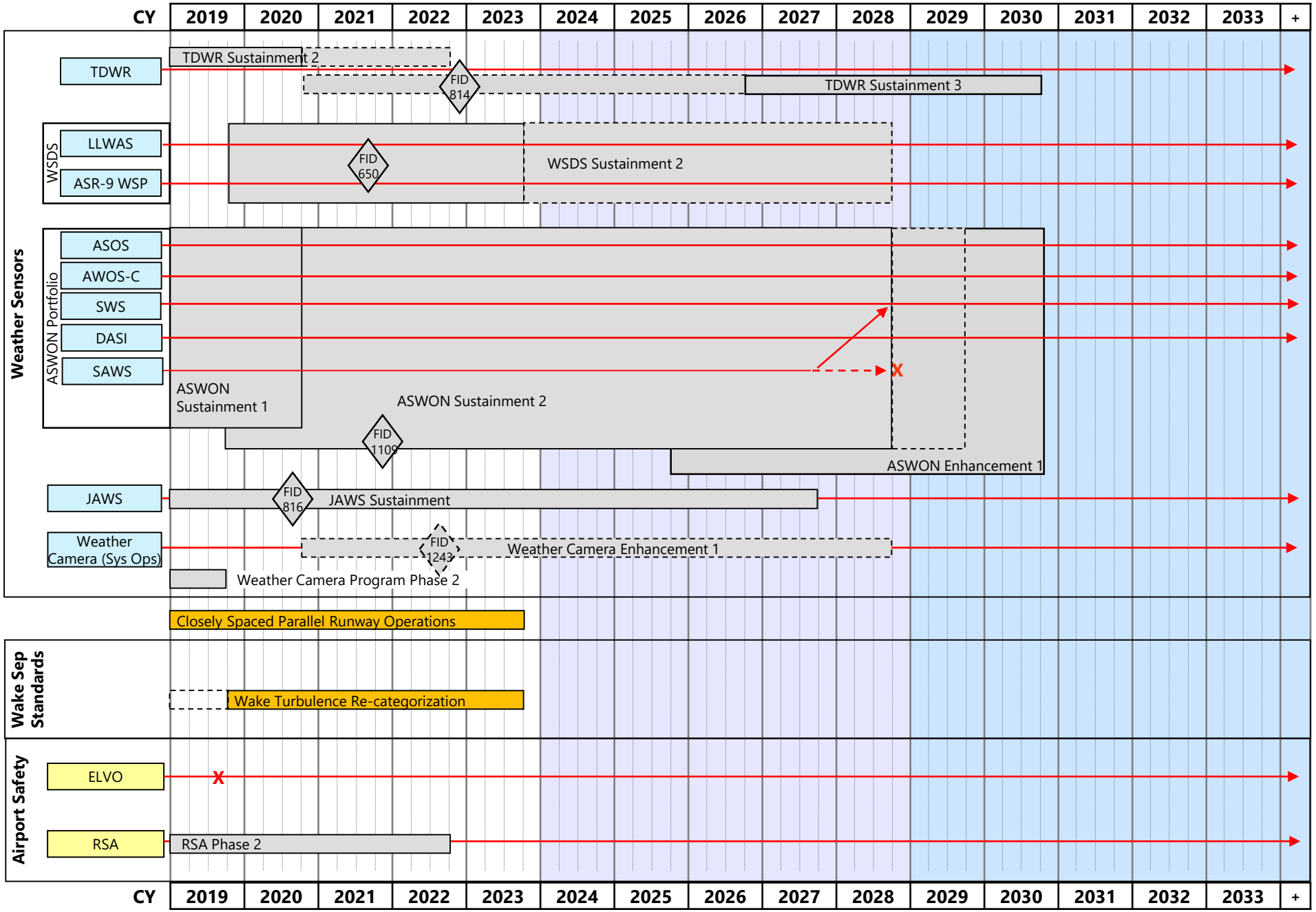
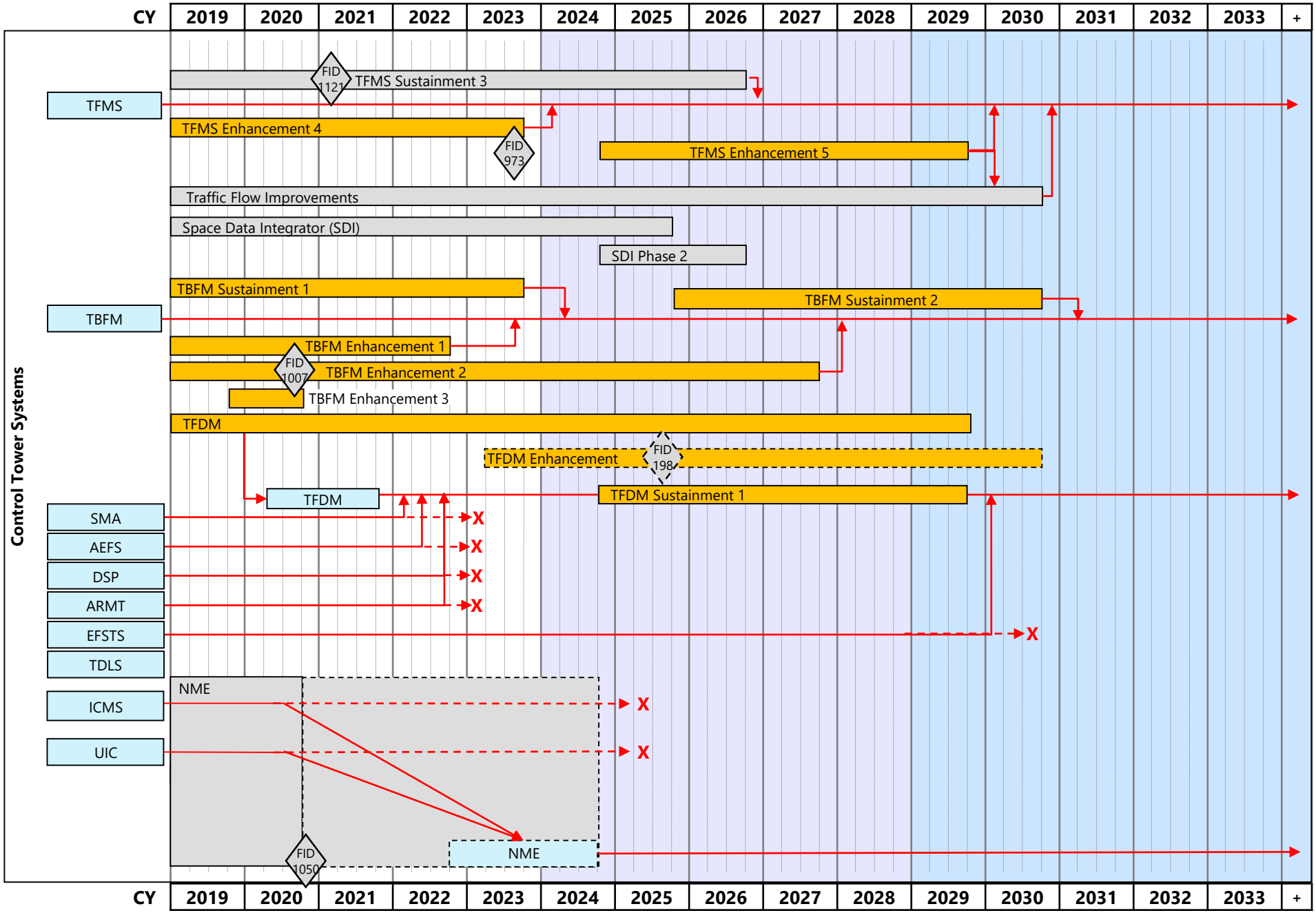
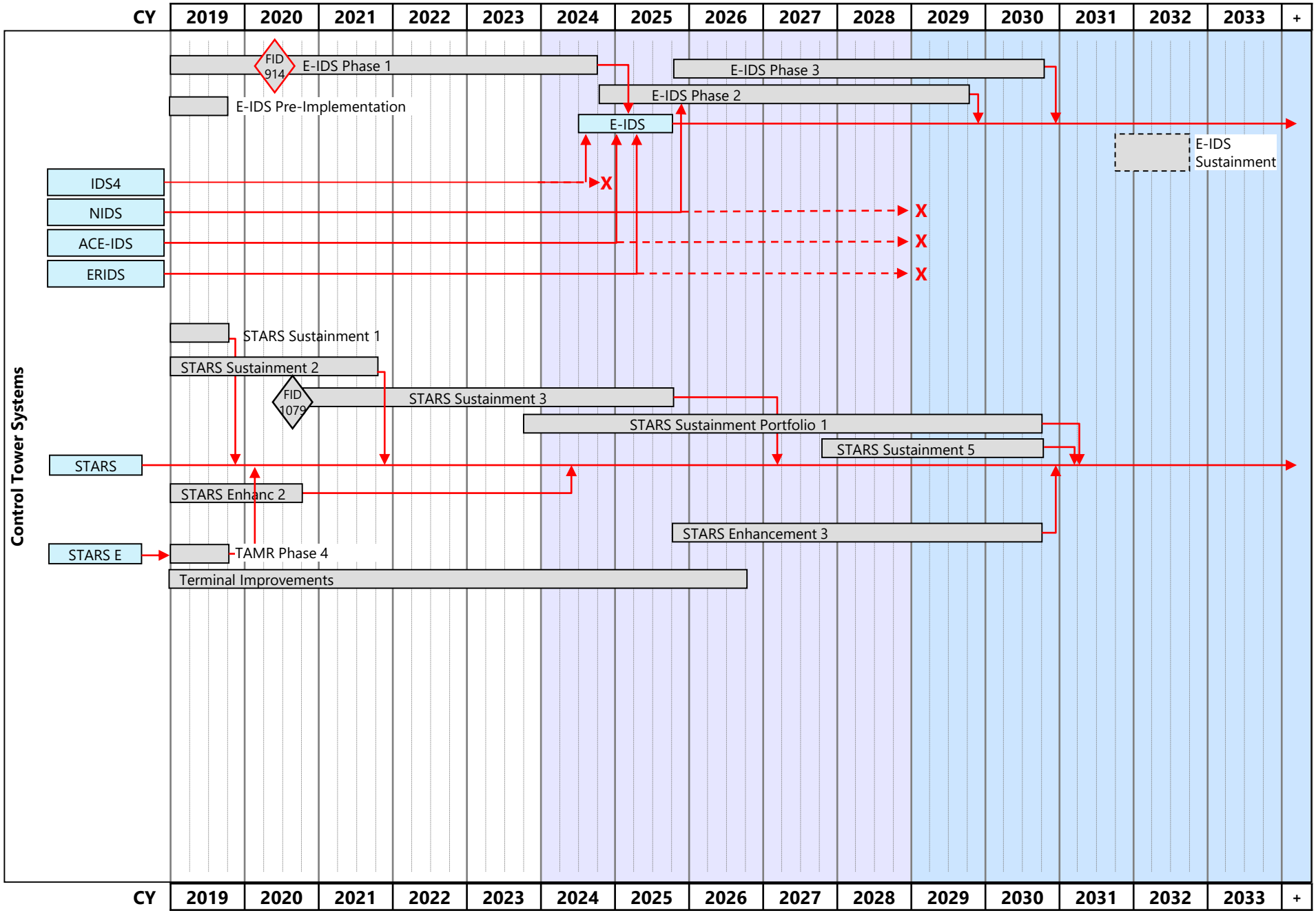
Airport Roadmap (3 of 5)



Airport Roadmap (4 of 5)



Airport Roadmap (5 of 5)



Airport Roadmap: Assumptions

Identifier	Description
APT-01	The Airports roadmap will focus on systems and services operating and being performed airside at medium/large Airports and does not include functions/infrastructure internal to the Airport (i.e., security, ground transportation, or baggage handling, etc.).
APT-02	This roadmap is used to provide an evolutionary overview of medium to large Airports and does not convey infrastructure or service implementation specific to an Airport.
APT-04	Majority of this roadmap's content has been pulled from other roadmaps (i.e., Comm, Surveillance, Weather, etc.) if it is in support of Airport Airside Operations.
APT-07	Although there are Non-Fed Navigational Aids (NAVAIDS) and facilities located as some Airports, they may not be depicted fully on the Airports Infrastructure Roadmap.
APT-08	All FTI sub-systems will be assumed by FENS once the TDM-to-IP migration is complete.

Airport Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
74	2021 Q1	No	Communication	FID	Final Investment Decision (FID) for FAA Enterprise Network Services (FENS)
198	2025 Q3	No	Automation	FID	Final Investment Decision (FID) for TFDM Enhancement
220	2026 Q4	No	Navigation	Strategy (Other)	Decision to Cut Over to Dual Frequency / Multi-Constellation Operations Based on Completion of Dual Frequency (GPS L1 and L5) Development & Testing
650	2021 Q3	No	Weather	FID	Final Investment Decision (FID) for WSDS Sustainment
814	2022 Q4	No	Weather	FID	Final Investment Decision (FID) for TDWR Sustainment 3
816	2020 Q3	No	Weather	FID	Final Investment Decision (FID) for JAWS Sustainment
914	2020 Q2	Yes	Automation	FID	Final Investment Decision (FID) for Enterprise Information Display System (E-IDS)
956	2031 Q4	No	Aircraft	Regulatory Milestone	Publication of SBAS Dual-Frequency/Multi-Constellation (DFMC) MOPS
973	2023 Q3	No	Automation	FID	Final Investment Decision (FID) for TFMS Enhancement 5
1007	2020 Q3	No	Automation	FID	Final Investment Decision (FID) for TBFM Enhancement 2
1046	2020 Q1	No	Navigation	FID	Final Investment Decision (FID) for VOR MON Implementation - Phase 2
1050	2020 Q4	No	Navigation	FID	Final Investment Decision (FID) for NAVAIDS Monitoring Equipment
1071	2022 Q3	Yes	Navigation	Strategy (JRC)	Strategy Decision to Proceed with Segment 3 of NextGen DME Support for PBN Strategy
1079	2020 Q3	No	Automation	FID	Final Investment Decision (FID) for STARS Sustainment 3
1109	2021 Q4	No	Weather	FID	Final Investment Decision (FID) for ASWON Sustainment 2
1121	2021 Q1	No	Automation	FID	Final Investment Decision (FID) for TFMS Sustainment 3
1139	2021 Q3	No	Navigation	FID	Final Investment Decision (FID) for Wide-Area Augmentation System (WAAS) Phase 4B
1140	2019 Q2	No	Navigation	Strategy (JRC)	Strategy Decision for the Supportability of Distance Measuring Equipment (DME) Very High Frequency Omni-Directional Range (VOR) Tactical Air Navigation (TACAN) [DVT]
1163	2019 Q3	Yes	Communication	Strategy (Other)	TDM-to-IP Portfolio Strategy Decision
1192	2020 Q1	No	Communication	FID	Final Investment Decision (FID) for ASTI Sustainment

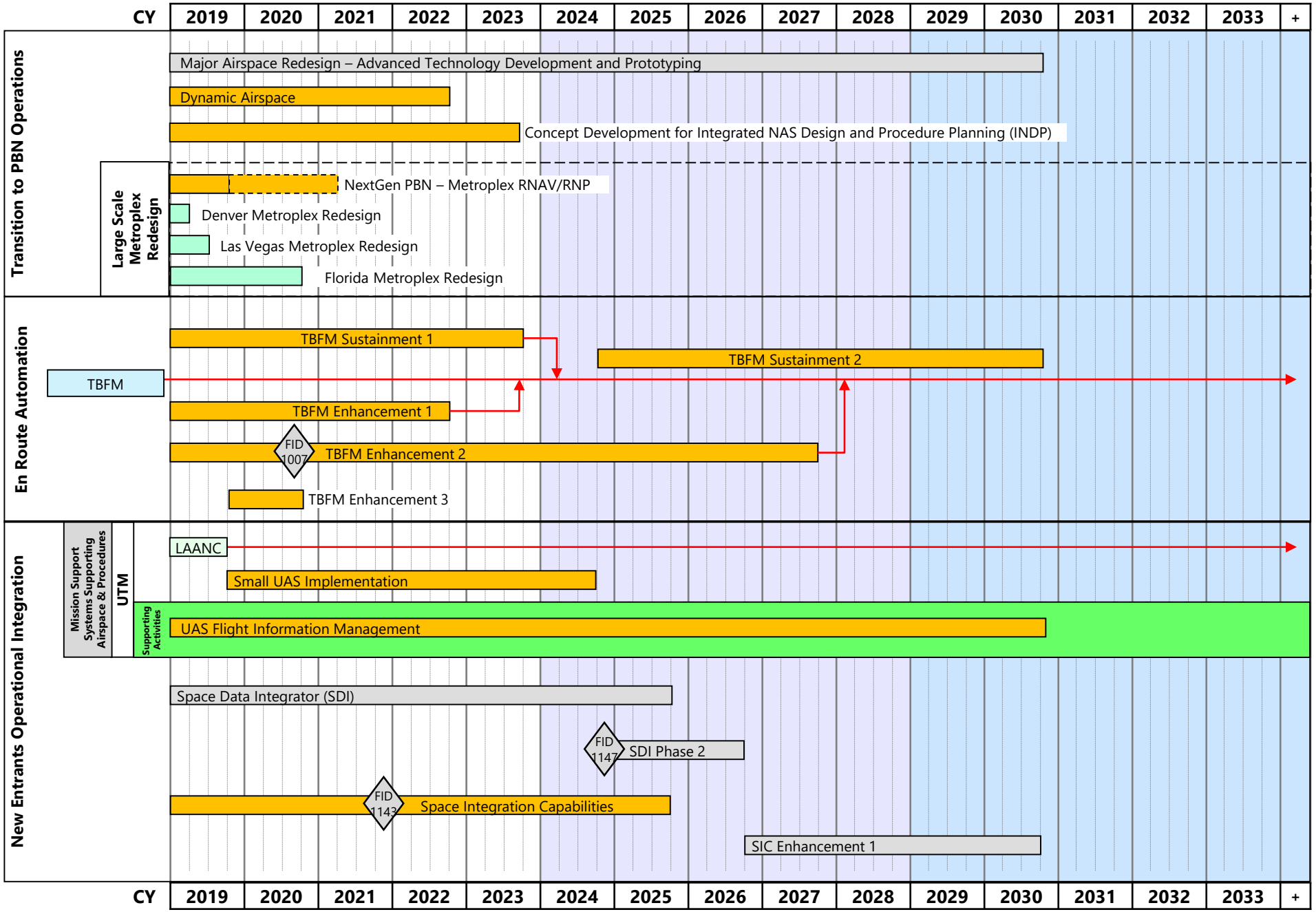
Airport Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1197	2019 Q4	No	Navigation	Strategy (JRC)	ILS Rationalization Strategy Decision
1202	2019 Q3	No	Navigation	Strategy (JRC)	Strategy Decision for WAAS Phase 4B #1
1243	2022 Q3	No	Weather	FID	Final Investment Decision (FID) for Weather Camera Enhancement 1

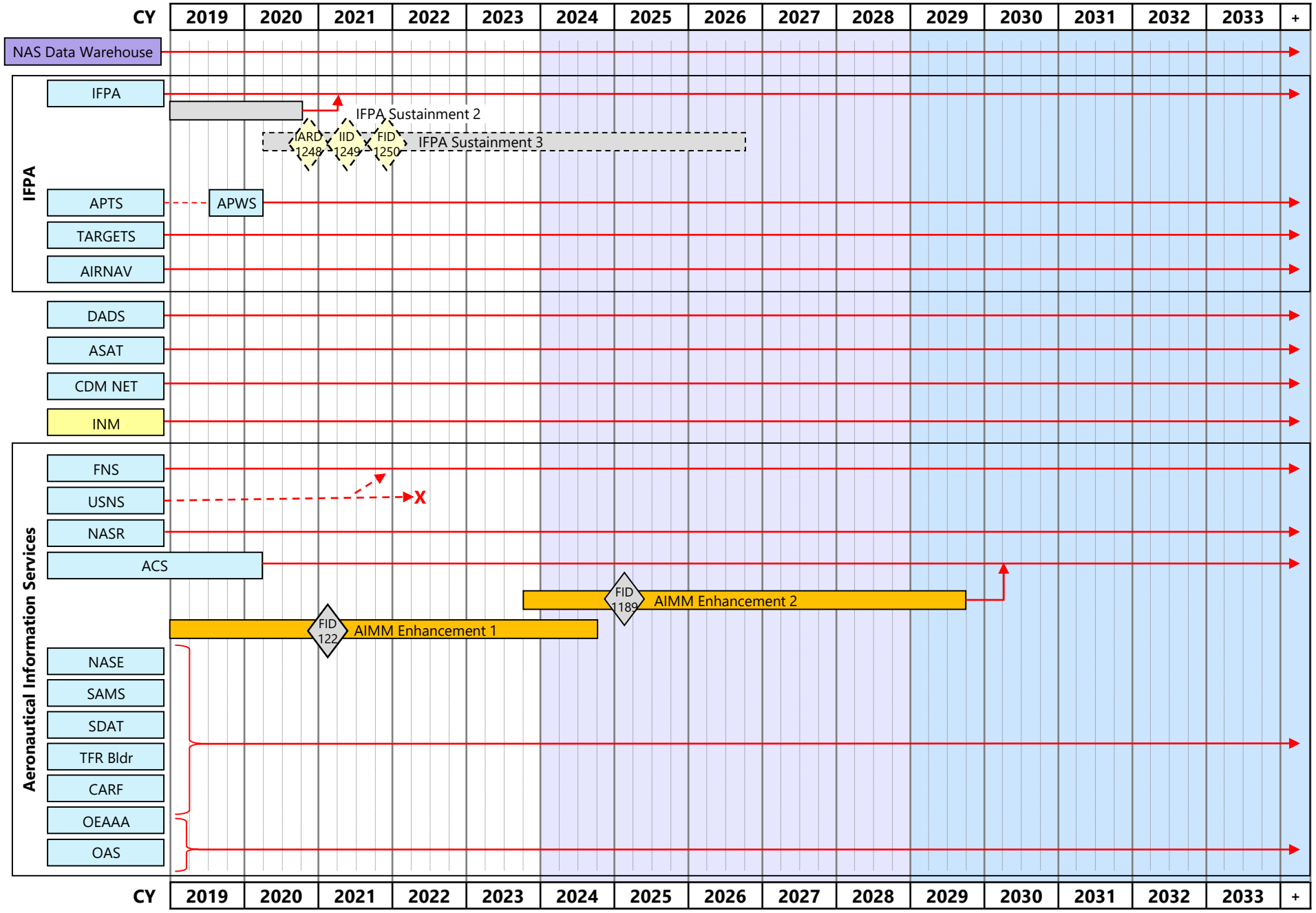
Airspace and Procedures

Objective: The Airspace and Procedures roadmap presents an Executive View (EV) of systems and procedures, including associated research projects, with an effect on the large-scale redesign and optimization of major airspace.

Airspace & Procedures Roadmap (1 of 3)



Airspace & Procedures Roadmap (2 of 3)



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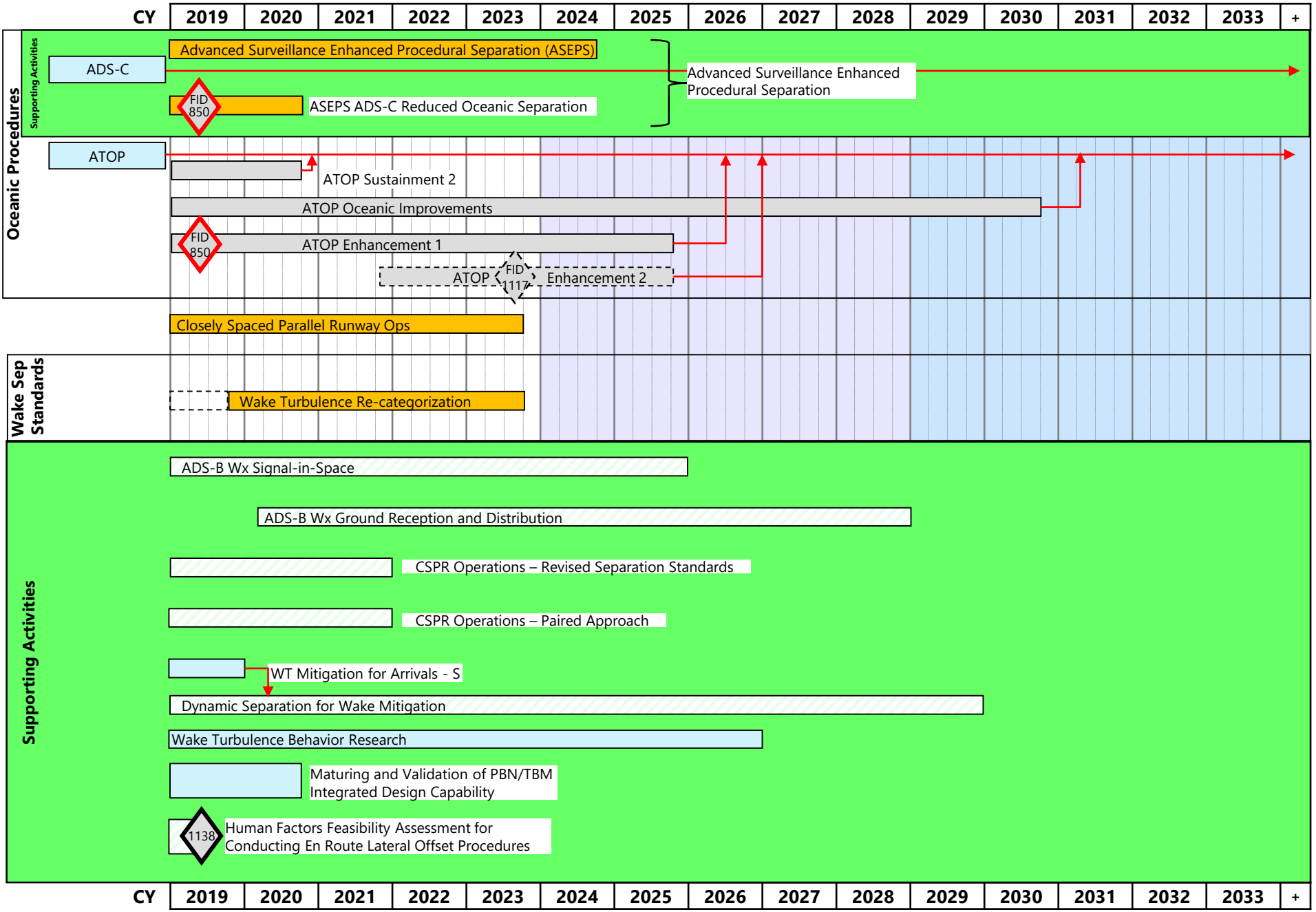
Airspace & Procedures Roadmap (3 of 3)



Airspace & Procedures Roadmap: Assumptions

Identifier	Description
A&P-01	Airspace Modernization Assumptions a) Flexibility into any of the agency's facility plans b) Future Airspace & NASA research funding is sufficient and provides favorable benefits c) System Dependencies 1. ADS-B 2. ERAM 3. DataComm
A&P-02	Integrated Arrival/Departure Airspace (Big Airspace) Assumptions a) Key Integrated Arrival/Departure Airspace enablers: 1. Extension of 3 Mile Separation & Terminal Procedures 2. Integrated arrival/departure airspace configurations 3. Flexible sector & bi-directional routes published 4. 5 mile lateral spacing for Required Navigation Performance (RNP) enables 5 mile lateral route spacing 5. New voice system (NAS Voice System), leased circuits, and Air-Ground communications channels to handle transition 6. Cost benefits are based on creating X Integrated Arrival/Departure (Big Airspace) facilities, covering X major metropolitan areas b) Cost analysis based on general assumptions about the concept, not on any detailed requirements or technical solutions c) Benefits analysis based on extrapolating results from FT simulations to other sites given traffic forecasts and historical weather patterns d) Sites identified where large TRACON facilities exist could accommodate additional BA operational positions with refurbishment. New buildings would be needed where no large TRACON exists.

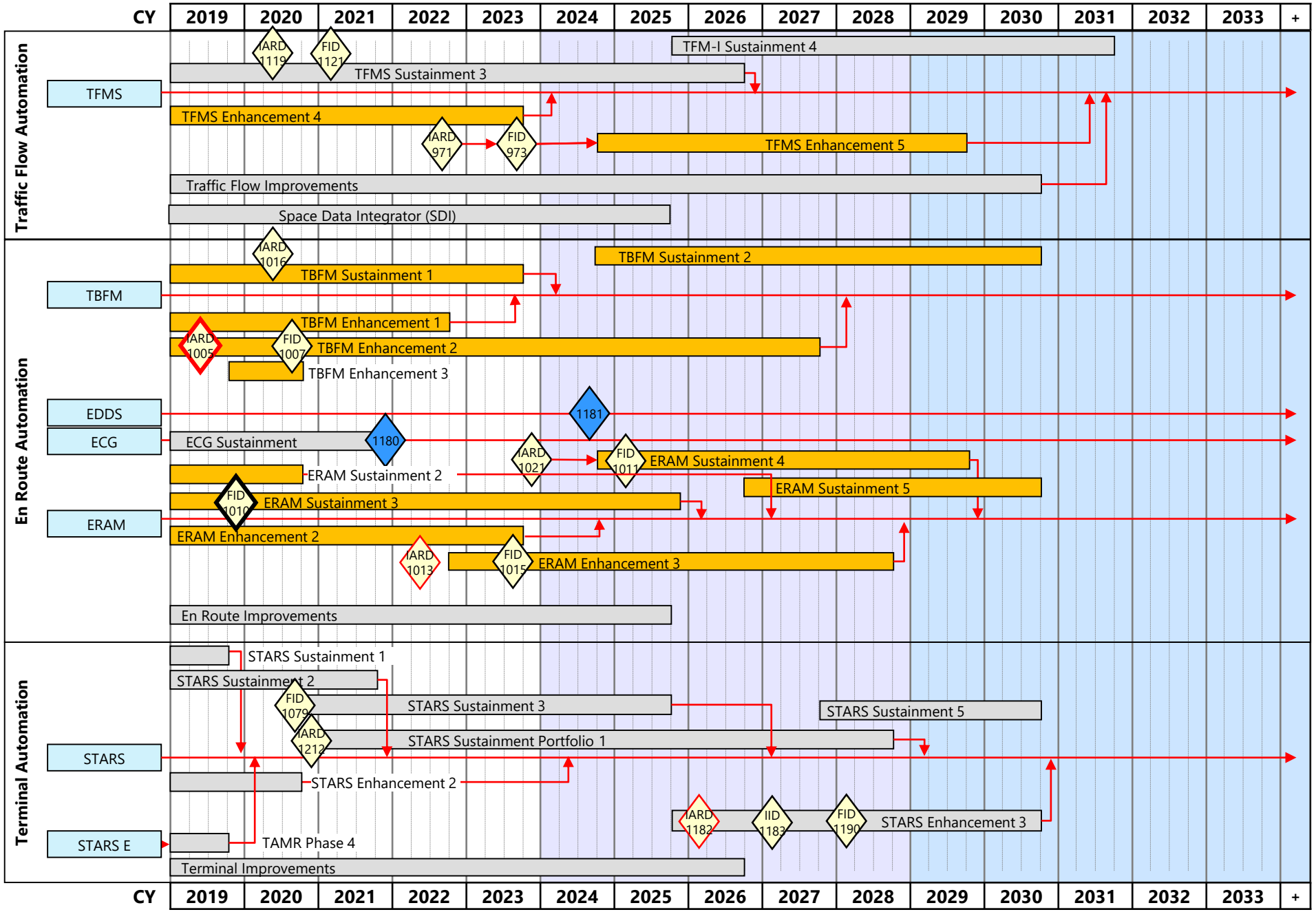
Airspace & Procedures Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
122	2021 Q1	No	Automation	FID	Final Investment Decision (FID) for AIMM Enhancement 1
850	2019 Q2	Yes	Automation	FID	Final Investment Decision (FID) for ATOP Enhancement 1
1007	2020 Q3	No	Automation	FID	Final Investment Decision (FID) for TBFM Enhancement 2
1117	2022 Q3	No	Automation	FID	Final Investment Decision (FID) for ATOP Enhancement 2
1138	2020 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Lateral Offset Procedures
1143	2021 Q4	No	New Entrants - Commercial Space	FID	Final Investment Decision (FID) for Space Integration Capabilities
1147	2024 Q4	No	New Entrants - Commercial Space	FID	Final Investment Decision (FID) for Space Data Integrator (SDI) Phase 2
1189	2025 Q1	No	Automation	FID	Final Investment Decision (FID) for AIMM Enhancement 2
1248	2020 Q4	No	Airspace & Procedures	IARD	Investment Analysis Readiness Decision (IARD) for Instrument Flight Procedures Automation (IFPA) Sustainment 3
1249	2021 Q2	No	Airspace & Procedures	IID	Initial Investment Decision (IID) for Instrument Flight Procedures Automation (IFPA) Sustainment 3
1250	2021 Q4	No	Airspace & Procedures	FID	Final Investment Decision (FID) for Instrument Flight Procedures Automation (IFPA) Sustainment 3

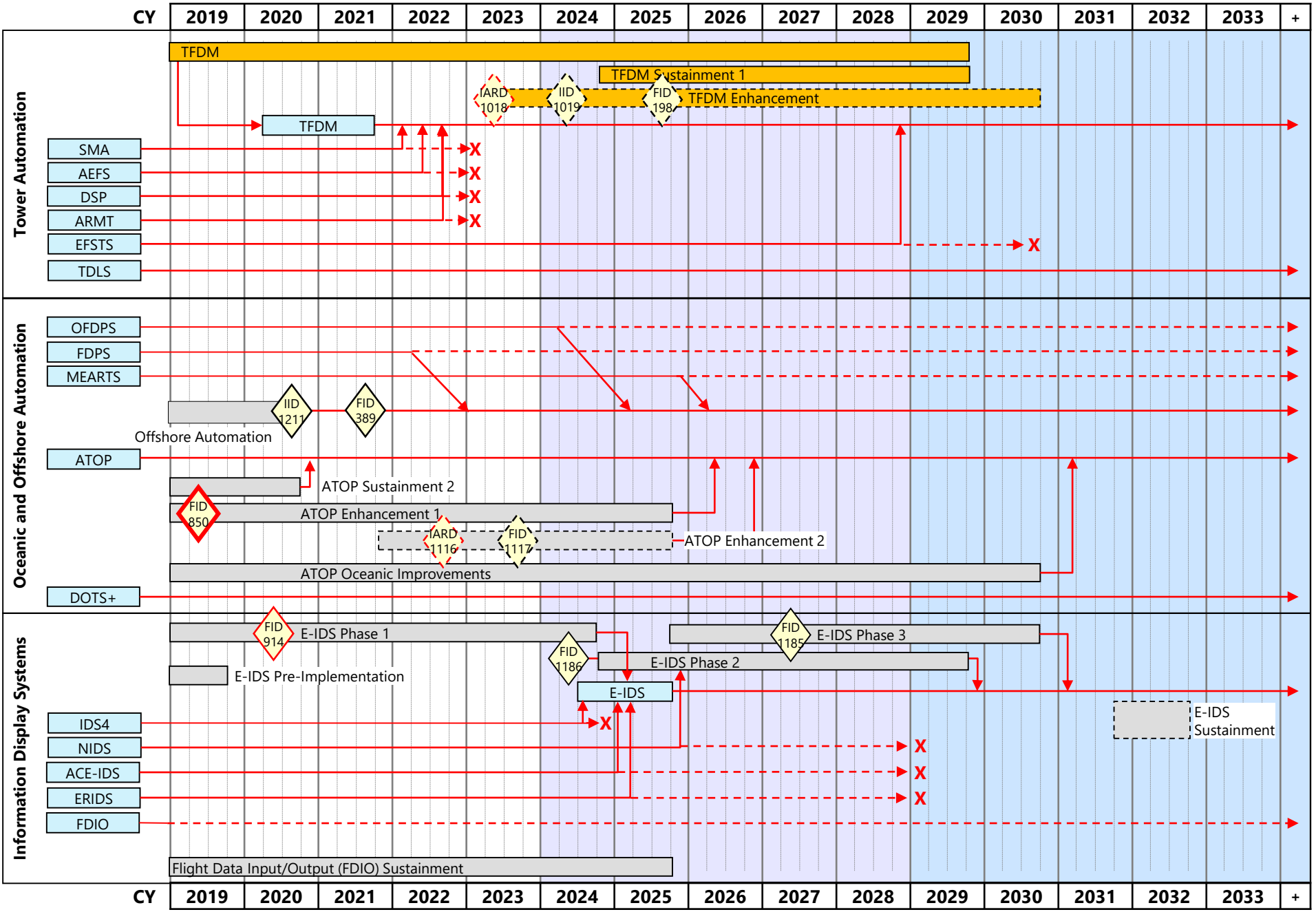
Automation

Objective: The Automation Roadmap presents an Executive View (EV) of the current automation systems supporting the National Airspace System (NAS) and their enhancement, sustainment or replacement through major development programs and support activities. The Automation Roadmap is intended to convey the major automation program strategy and acquisition decision points as well as program execution through the In-Service Decision. The roadmap serves as a summary view of more detailed plans within each development program.

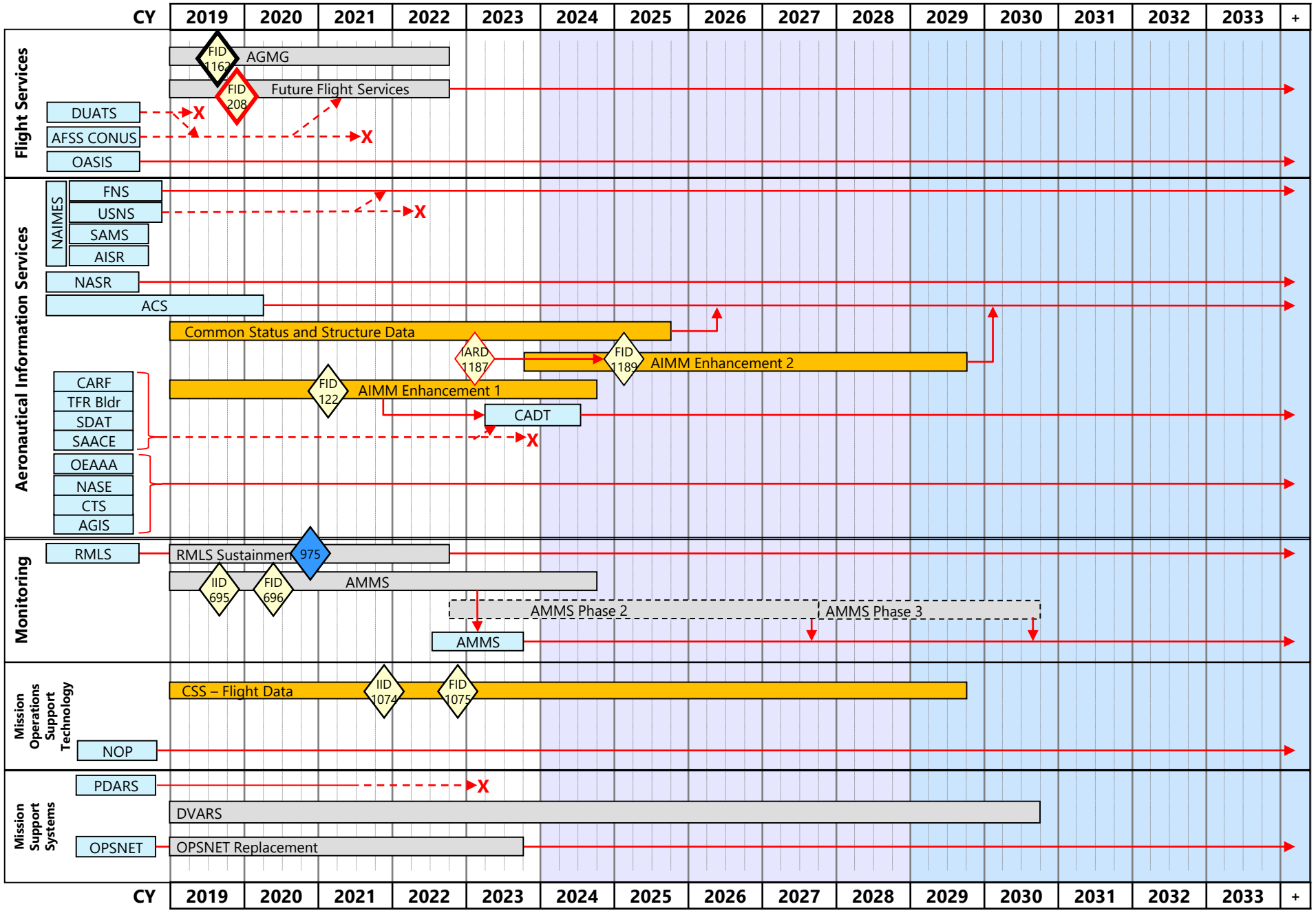
Automation Roadmap (1 of 4)



Automation Roadmap (2 of 4)



Automation Roadmap (3 of 4)



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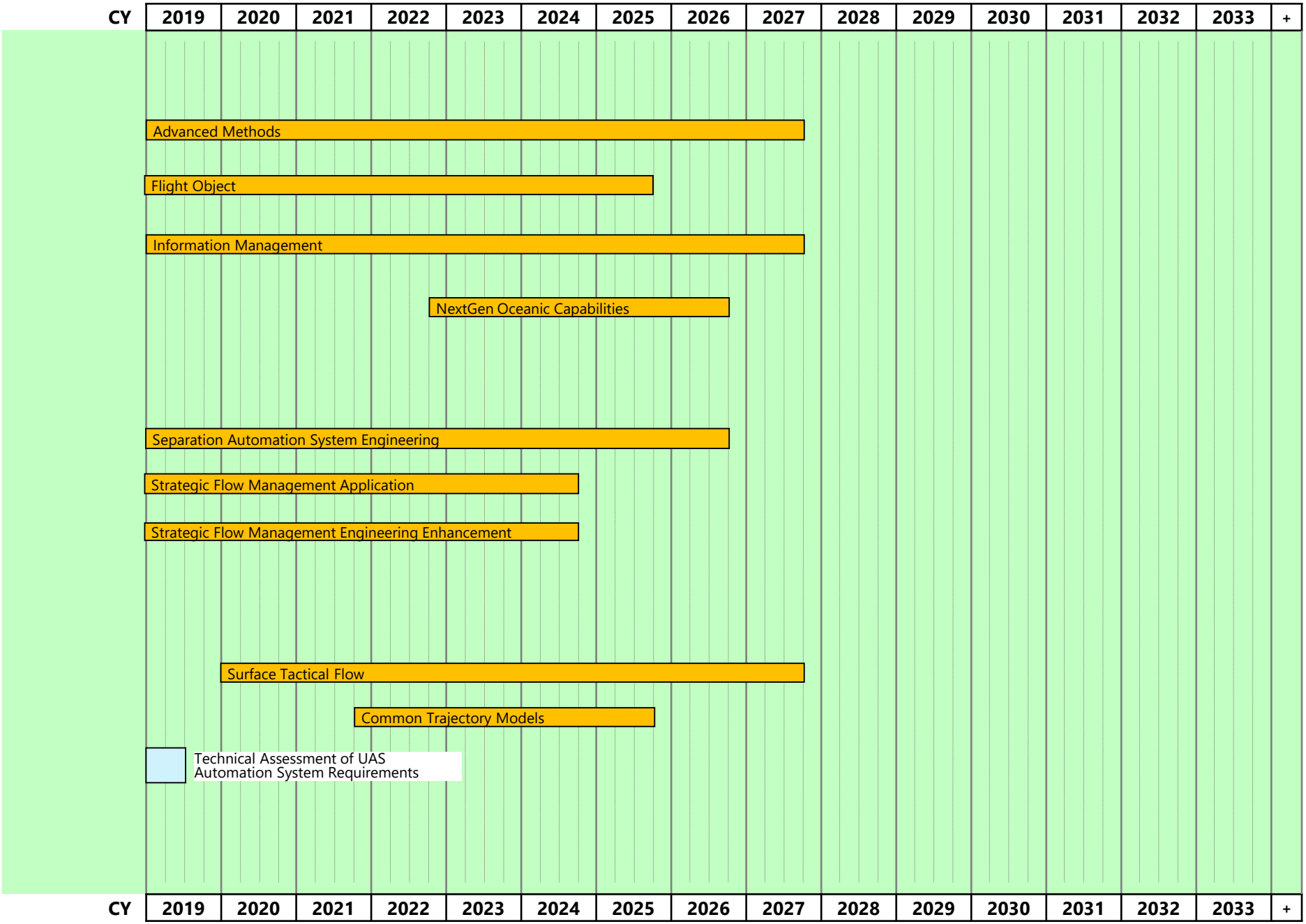
Automation Roadmap (4 of 4)



Automation Roadmap: Assumptions

Identifier	Description
AUTO-01	Net-centric Enterprise Services will replace designated existing point to point interfaces with a system based on a Service Oriented Architecture providing enhanced data exchange, enhanced flexibility, and enhanced security for FAA Operations Personnel, and airspace users within a common information environment to support NextGen Operational Improvements.
AUTO-02	ADS-B is a necessary infrastructure element to support Trajectory Based Operations, Flexible Terminal, and High Density Terminal solution sets.
AUTO-03	Data Communication is a necessary infrastructure element to support Trajectory Based Operations, Flexible Terminal, and High Density Terminal solution sets.
AUTO-04	Operational Service Units will be responsible for JRC Final Investment Decisions.
AUTO-05	Policy and standards decisions prescribing the use of hand-held devices for data messaging by General Aviation pilots and aircraft are established.
AUTO-06	Consistent security management across Data Communication, Automation and SWIM support the evolution.
AUTO-07	Human-system integration will be conducted during analysis, design, development, and testing of Automation programs.
AUTO-08	Safety analysis and considerations will be included in all applicable phases of Automation analysis, design, development, and testing and platforms will provide data as required for safety monitoring and analysis.
AUTO-09	Automation platform designs will support environmental and energy saving initiatives.

Automation Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
122	2021 Q1	No	Automation	FID	Final Investment Decision (FID) for AIMM Enhancement 1
198	2025 Q3	No	Automation	FID	Final Investment Decision (FID) for TFDM Enhancement
208	2019 Q4	Yes	Automation	FID	Final Investment Decision (FID) for Future Flight Services
389	2021 Q3	No	Automation	FID	Final Investment Decision (FID) for Offshore Automation
695	2019 Q3	No	Automation	IID	Initial Investment Decision (IID) for AMMS
696	2020 Q2	No	Automation	FID	Final Investment Decision (FID) for AMMS
850	2019 Q2	Yes	Automation	FID	Final Investment Decision (FID) for ATOP Enhancement 1
914	2020 Q2	Yes	Automation	FID	Final Investment Decision (FID) for Enterprise Information Display System (E-IDS)
971	2022 Q3	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TFMS Enhancement 5
973	2023 Q3	No	Automation	FID	Final Investment Decision (FID) for TFMS Enhancement 5
975	2020 Q4	No	Automation	Strategy (Other)	Strategy Decision to Determine Future Relation Between RMLS and AMMS
1005	2019 Q2	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TBFM Enhancement 2
1007	2020 Q3	No	Automation	FID	Final Investment Decision (FID) for TBFM Enhancement 2
1010	2019 Q4	No	Automation	FID	Final Investment Decision (FID) for ERAM Sustainment 3
1011	2025 Q1	No	Automation	FID	Final Investment Decision (FID) for ERAM Sustainment 4
1013	2022 Q2	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ERAM Enhancement 3
1015	2023 Q3	No	Automation	FID	Final Investment Decision (FID) for ERAM Enhancement 3
1016	2020 Q2	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TBFM Sustainment 1
1018	2023 Q2	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TFDM Enhancement
1019	2024 Q2	No	Automation	IID	Initial Investment Decision (IID) for TFDM Enhancement

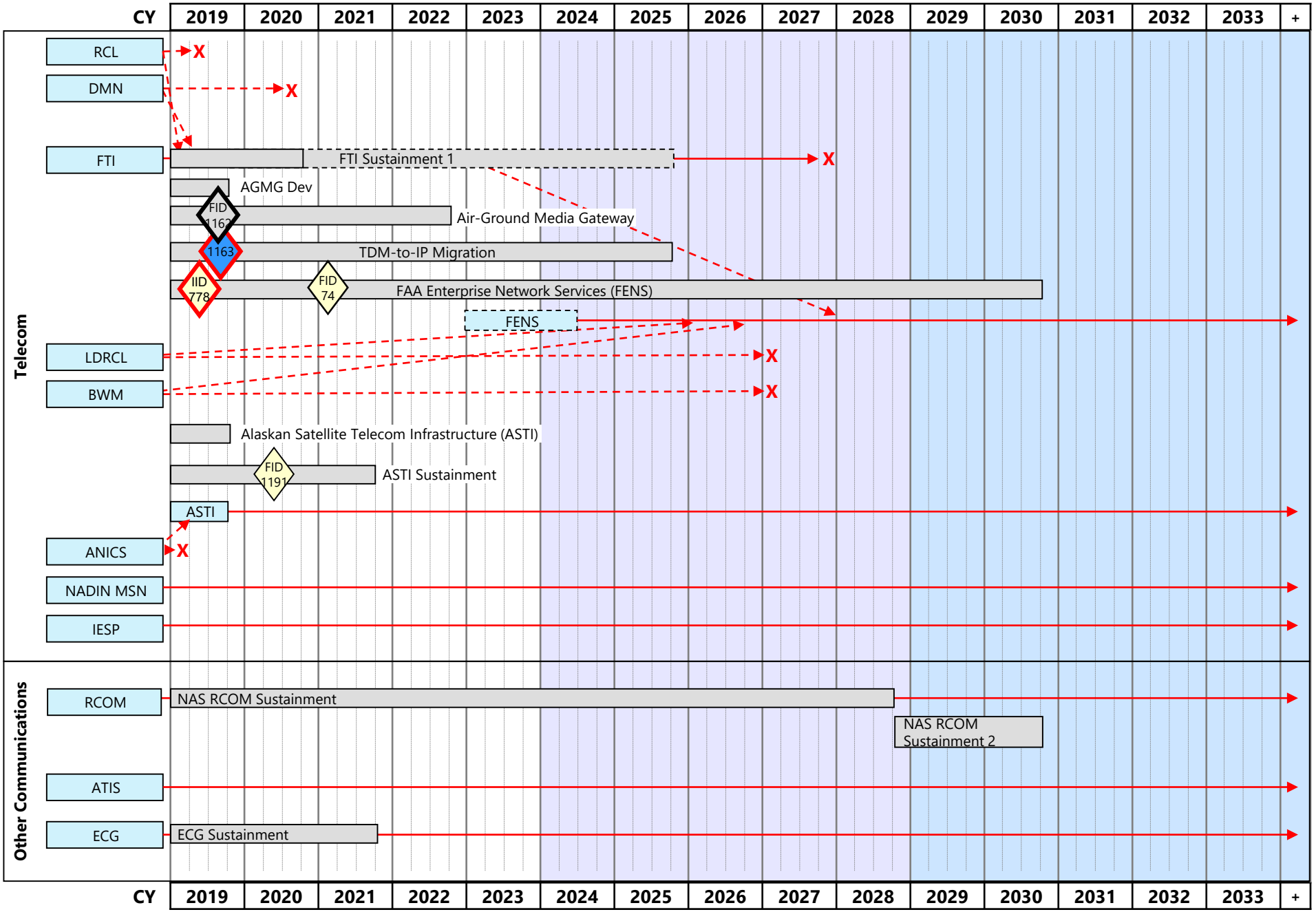
Automation Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1021	2023 Q4	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ERAM Sustainment 4
1074	2021 Q4	No	Automation	IID	Initial Investment Decision (IID) for Common Support Services - Flight Data
1075	2022 Q4	No	Automation	FID	Final Investment Decision (FID) for Common Support Services - Flight Data
1079	2020 Q3	No	Automation	FID	Final Investment Decision (FID) for STARS Sustainment 3
1116	2022 Q3	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for ATOP Enhancement 2
1117	2023 Q3	No	Automation	FID	Final Investment Decision (FID) for ATOP Enhancement 2
1119	2020 Q2	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for TFMS Sustainment 3
1121	2021 Q1	No	Automation	FID	Final Investment Decision (FID) for TFMS Sustainment 3
1162	2019 Q3	No	Automation	FID	Final Investment Decision (FID) #2 for Air-to-Ground Media Gateway
1180	2021 Q4	No	Automation	Strategy (Other)	Strategy Decision for ECG Sustainment
1181	2024 Q3	No	Automation	Strategy (Other)	Strategy Decision for EDDS
1182	2026 Q1	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for STARS Enhancement 3
1183	2027 Q1	No	Automation	IID	Initial Investment Decision (IID) for STARS Enhancement 3
1185	2027 Q2	No	Automation	FID	Final Investment Decision (FID) for E-IDS Phase 3
1186	2024 Q2	No	Automation	FID	Final Investment Decision (FID) for E-IDS Phase 2
1187	2023 Q1	Yes	Automation	IARD	Investment Analysis Readiness Decision (IARD) for AIMM Enhancement 2
1189	2025 Q1	No	Automation	FID	Final Investment Decision (FID) for AIMM Enhancement 2
1190	2028 Q1	No	Automation	FID	Final Investment Decision (FID) for STARS Enhancement 3
1211	2020 Q3	No	Automation	IID	Initial Investment Decision (IID) for Offshore Automation
1212	2020 Q4	No	Automation	IARD	Investment Analysis Readiness Decision (IARD) for STARS Sustainment Portfolio 1

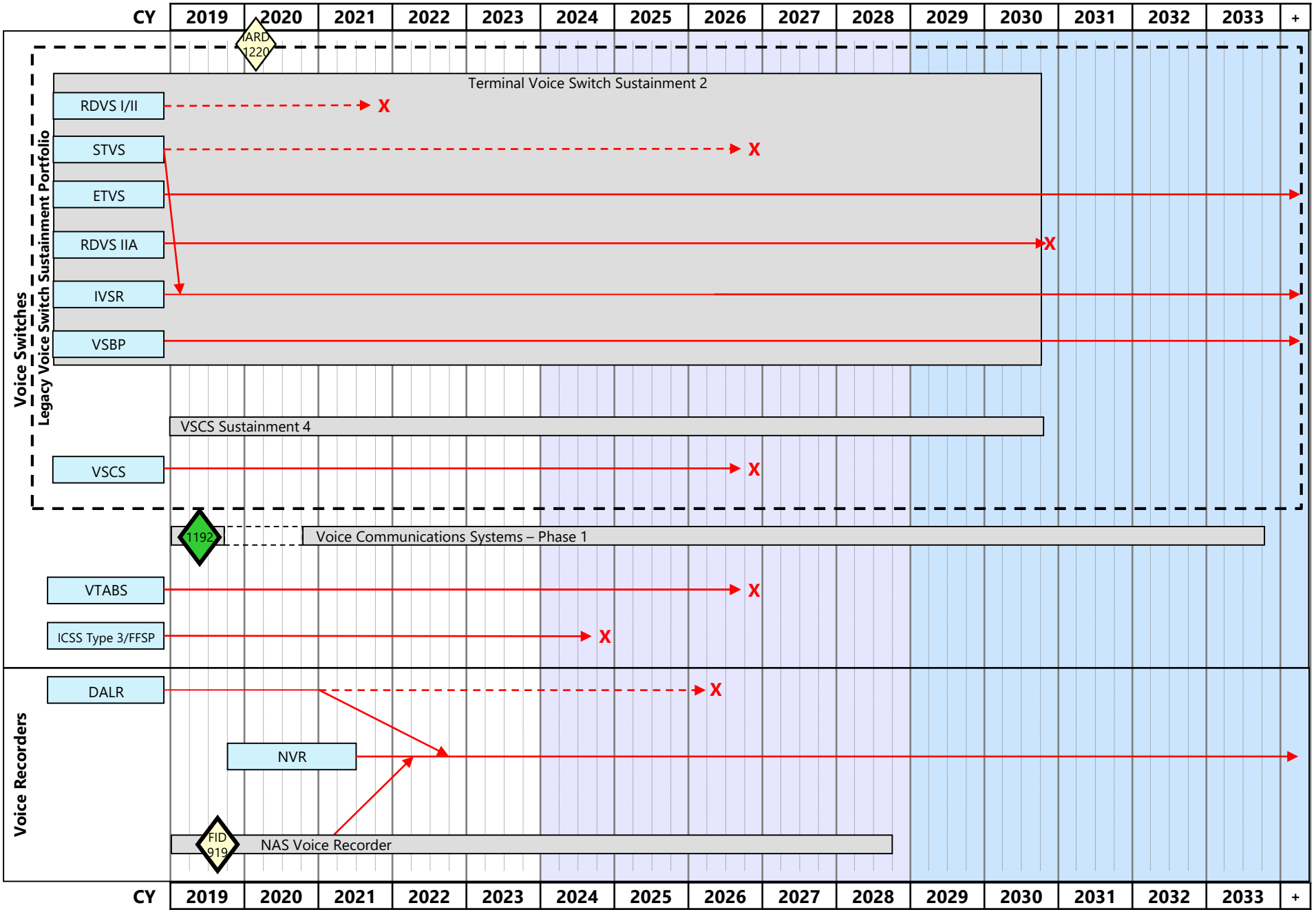
Communication

Objective: The Communication Roadmap presents an Executive View (EV) of the current communication systems supporting the National Airspace System and their enhancement, sustainment or replacement through major development programs and support activities. The Communications Roadmap is intended to convey the major communication program strategy and acquisition decision points as well as program funding. The roadmap serves as a summary view of more detailed plans within each development program.

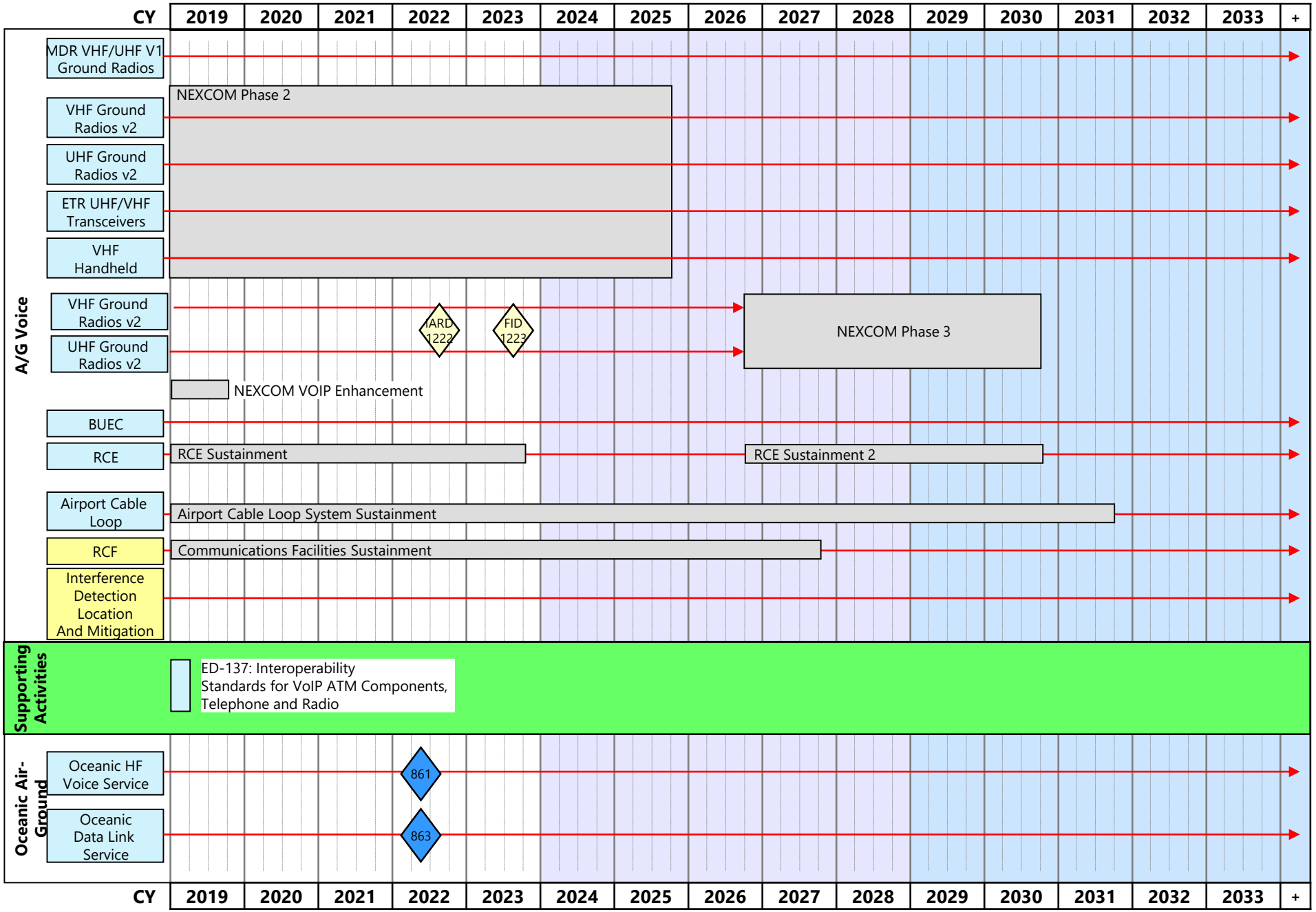
Communication Roadmap (1 of 5)



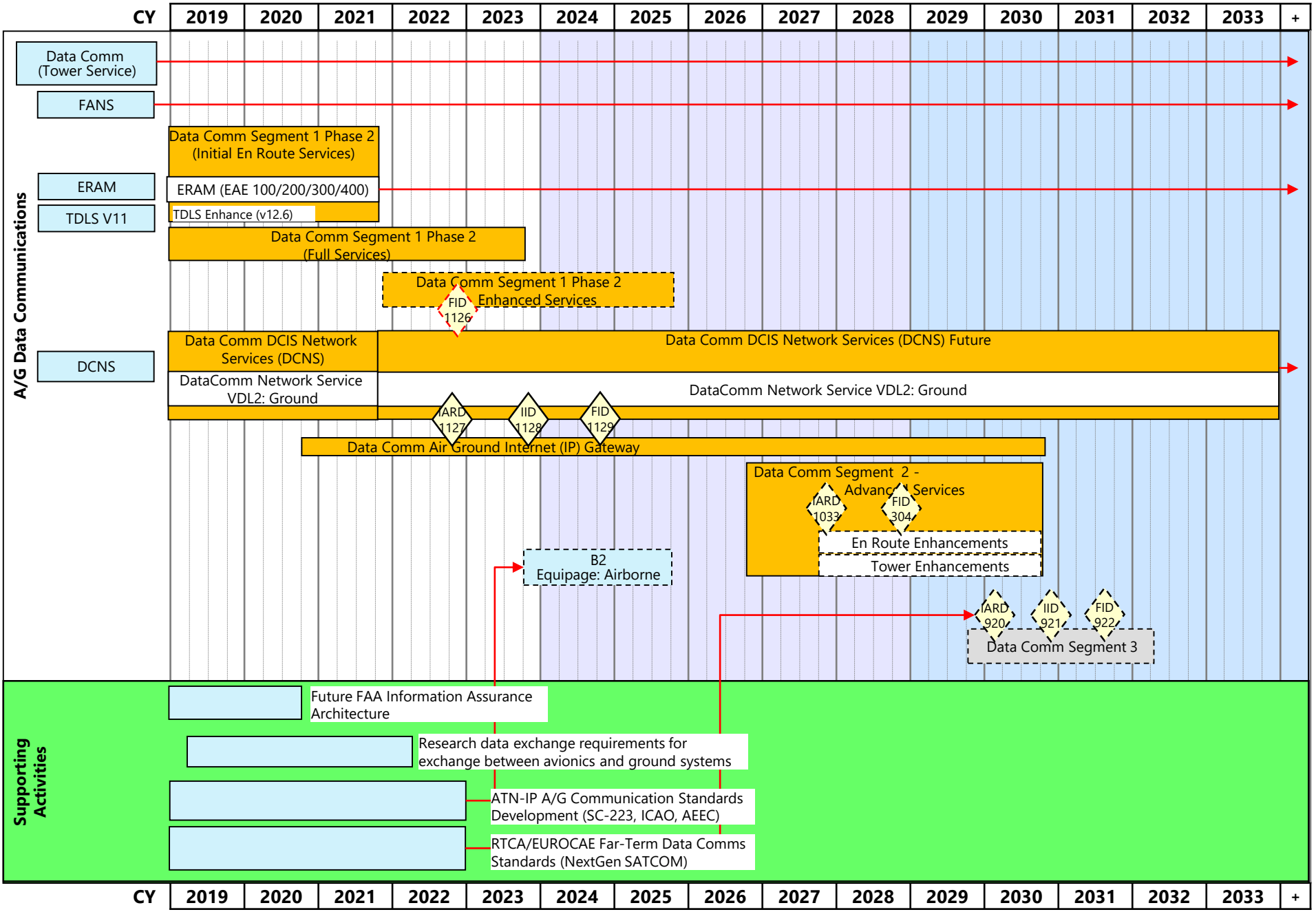
Communication Roadmap (2 of 5)



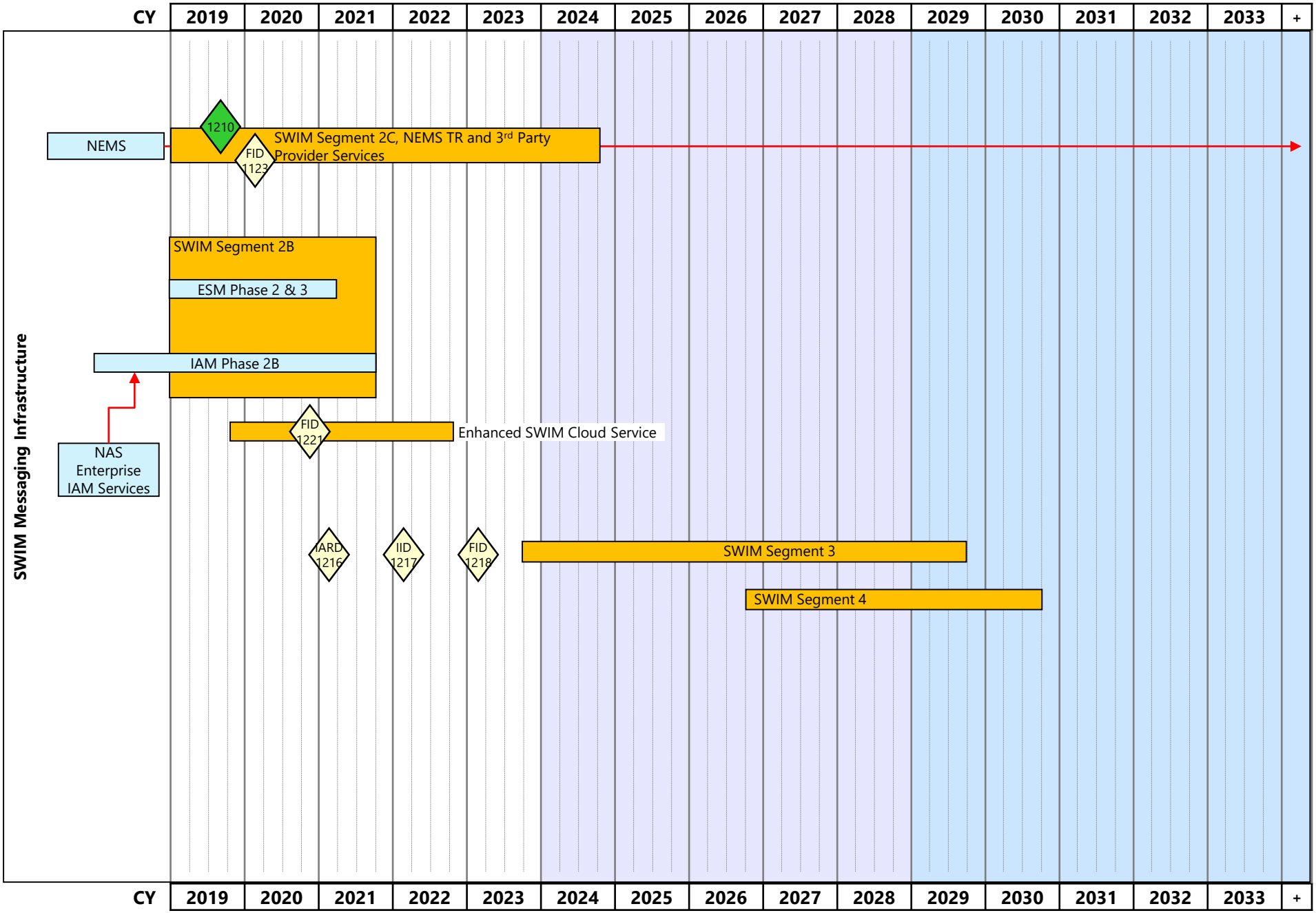
Communication Roadmap (3 of 5)



Communication Roadmap (4 of 5)



Communication Roadmap (5 of 5)



Communication Roadmap: Assumptions

Identifier	Description
COMM-01	FENS will become the primary ground-based Voice/Data transport system.
COMM-02	All domestic flight safety critical A/G communications are over VHF based systems. Advisory communications (e.g. Weather, NAS Status, NOTAMS) can be supported by VHF A/G Communication or by commercial communications services through airborne access to SWIM services.
COMM-04	Relationship between SWIM and Communications: SWIM Dataflows all leverage NAS OPS IP service and initial SWIM Segment 2 infrastructure is being implemented with FTI & FENS.
COMM-06	ASTI (ANICS) will not be integrated into FAA Telecommunications Infrastructure contract.
COMM-07	FIDI TR will develop IP communication protocols between automation systems (e.g. ERAM, terminal clients) which end systems will provide the investment necessary to implement required changes.
COMM-08	JRC approved a joint IID for DataComm Segment 1 and 2 in 2008; therefore, it is projected that IID for Segment 2 will be waived.

Communication Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
74	2021 Q1	No	Communication	FID	Final Investment Decision (FID) for FAA Enterprise Network Services (FENS)
304	2028 Q4	No	Communication	FID	Final Investment Decision (FID) for Data Comm Segment 2
778	2019 Q2	Yes	Communication	IID	Initial Investment Decision (IID) for FAA Enterprise Network Services (FENS)
861	2022 Q2	No	Communication	Strategy (Other)	Strategy decision to determine need for continuation of Oceanic HF Voice Services
863	2022 Q2	No	Communication	Strategy (Other)	Strategy decision to determine need for continuation of Oceanic Data Link Services
919	2019 Q3	No	Communication	FID	Final Investment Decision (FID) for NAS Voice Recorder
920	2030 Q1	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for DataComm Segment 3
921	2030 Q4	No	Communication	IID	Initial Investment Decision (IID) for DataComm Segment 3
922	2031 Q3	No	Communication	FID	Final Investment Decision (FID) for DataComm Segment 3
1033	2027 Q4	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for DataComm Segment 2
1123	2020 Q1	No	Communication	FID	Final Investment Decision (FID) for SWIM Segment 2C, NEMS TR and 3rd Party Provider Services
1126	2022 Q4	Yes	Communication	FID	Final Investment Decision (FID) for Data Comm Segment 1 Phase 2 Enhanced Services
1127	2022 Q4	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for Data Comm IP Gateway
1128	2023 Q4	No	Communication	IID	Initial Investment Decision (IID) for Data Comm IP Gateway
1129	2024 Q4	No	Communication	FID	Final Investment Decision (FID) for Data Comm IP Gateway
1162	2019 Q3	No	Automation	FID	Final Investment Decision (FID) #2 for Air-to-Ground Media Gateway
1163	2019 Q3	Yes	Communication	Strategy (Other)	TDM-to-IP Portfolio Strategy Decision
1191	2020 Q2	No	Communication	FID	Final Investment Decision (FID) for ASTI Sustainment
1192	2019 Q2	No	Communication	Strategy (JRC)	Voice Switch Portfolio Strategy Decision
1210	2019 Q3	No	Communication	Strategy (JRC)	Strategy Decision for SWIM 2C Scope Expansion

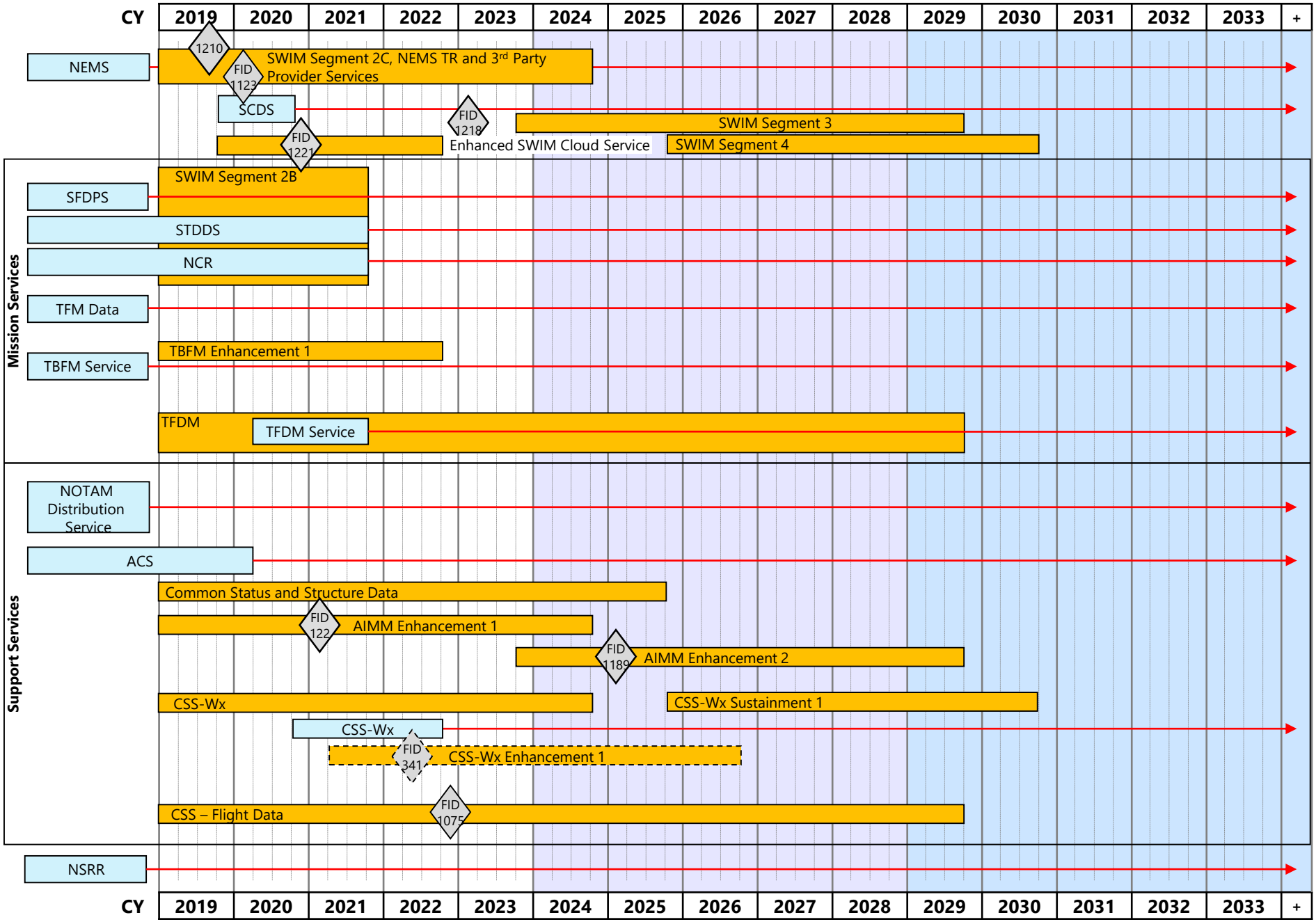
Communication Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1216	2021 Q1	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for SWIM Segment 3
1217	2022 Q1	No	Communication	IID	Initial Investment Decision (IID) for SWIM Segment 3
1218	2023 Q1	No	Communication	FID	Final Investment Decision (FID) for SWIM Segment 3
1220	2020 Q1	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for Legacy Voice Switch Sustainment Portfolio
1221	2020 Q4	No	Communication	FID	Final Investment Decision (FID) for Enhanced SWIM Cloud Service
1222	2022 Q3	No	Communication	IARD	Investment Analysis Readiness Decision (IARD) for NEXCOM Phase 3
1223	2023 Q3	No	Communication	FID	Final Investment Decision (FID) for NEXCOM Phase 3

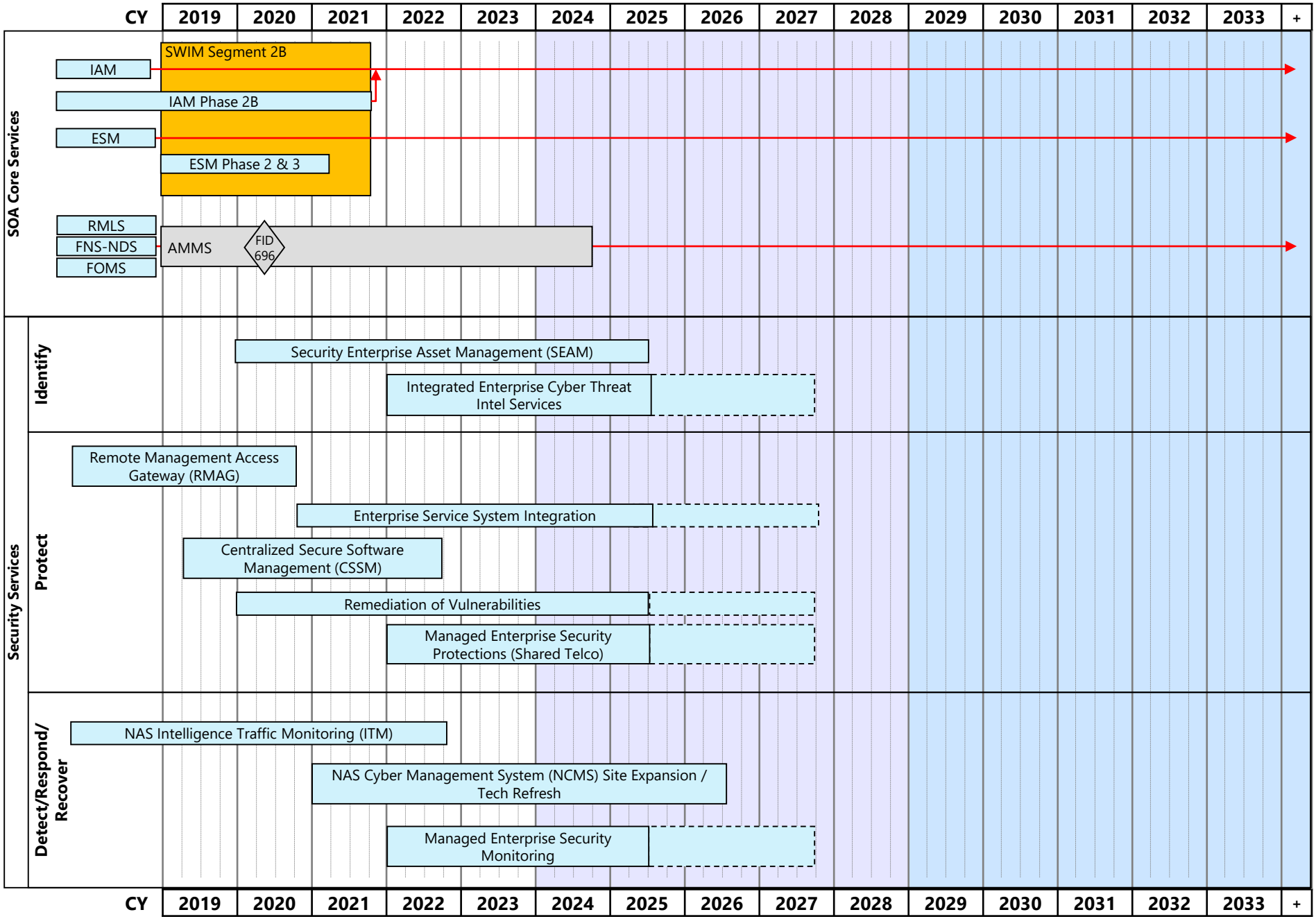
Enterprise Services

Objective: The Enterprise Services Roadmap presents an Executive View (EV) of the evolution of existing and planned enterprise services provided by NAS systems and programs and provides an outline of the major activities, decisions, and milestones. By definition, services are capabilities that exist as processes, applications, infrastructure, or any combination. They are implemented using design principles that support and promote enterprise-wide interoperability, sharing, standardization, federation, awareness, loose coupling, granularity, modularity, abstraction, reuse, and flexibility.

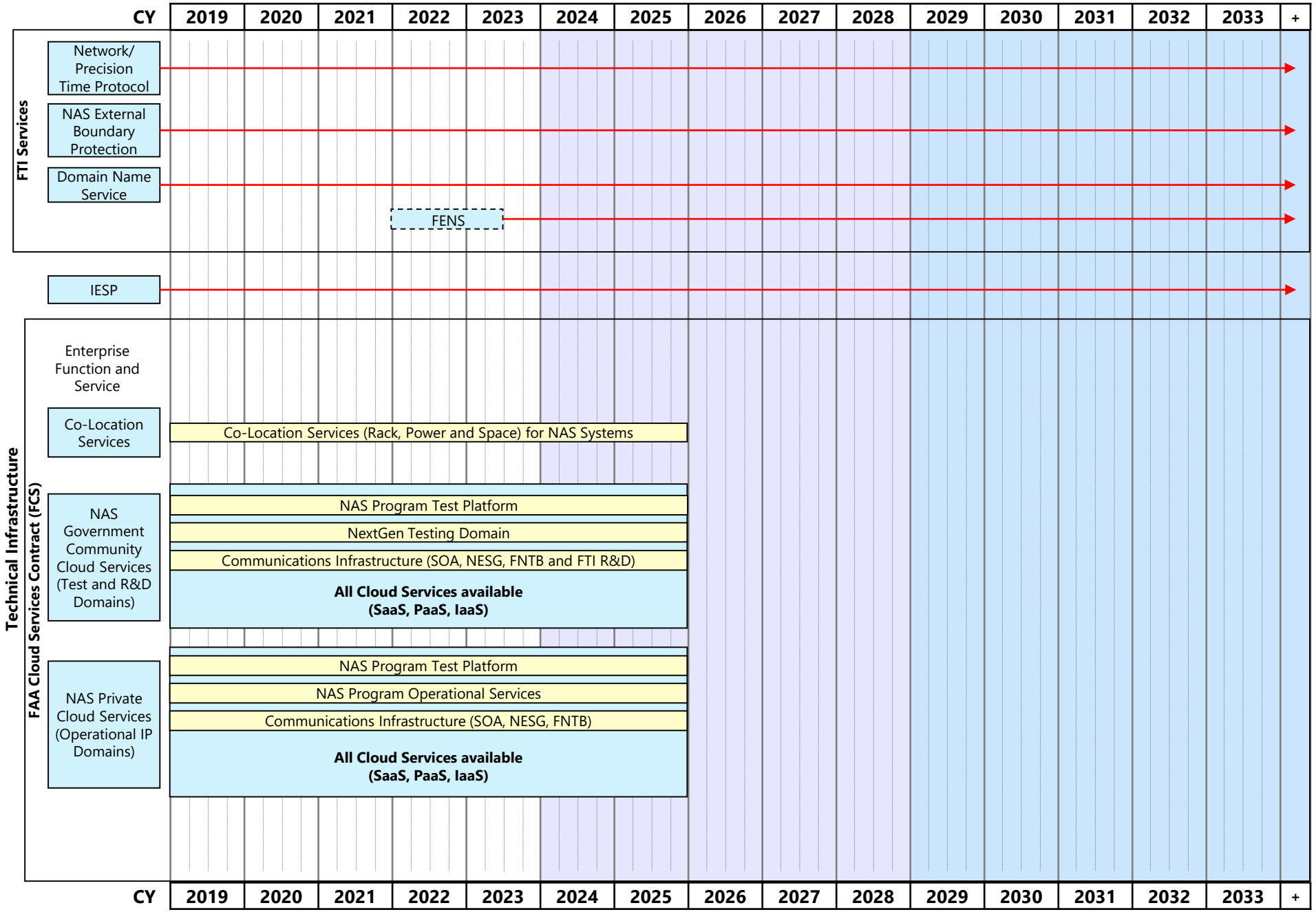
Enterprise Services Roadmap (1 of 4)



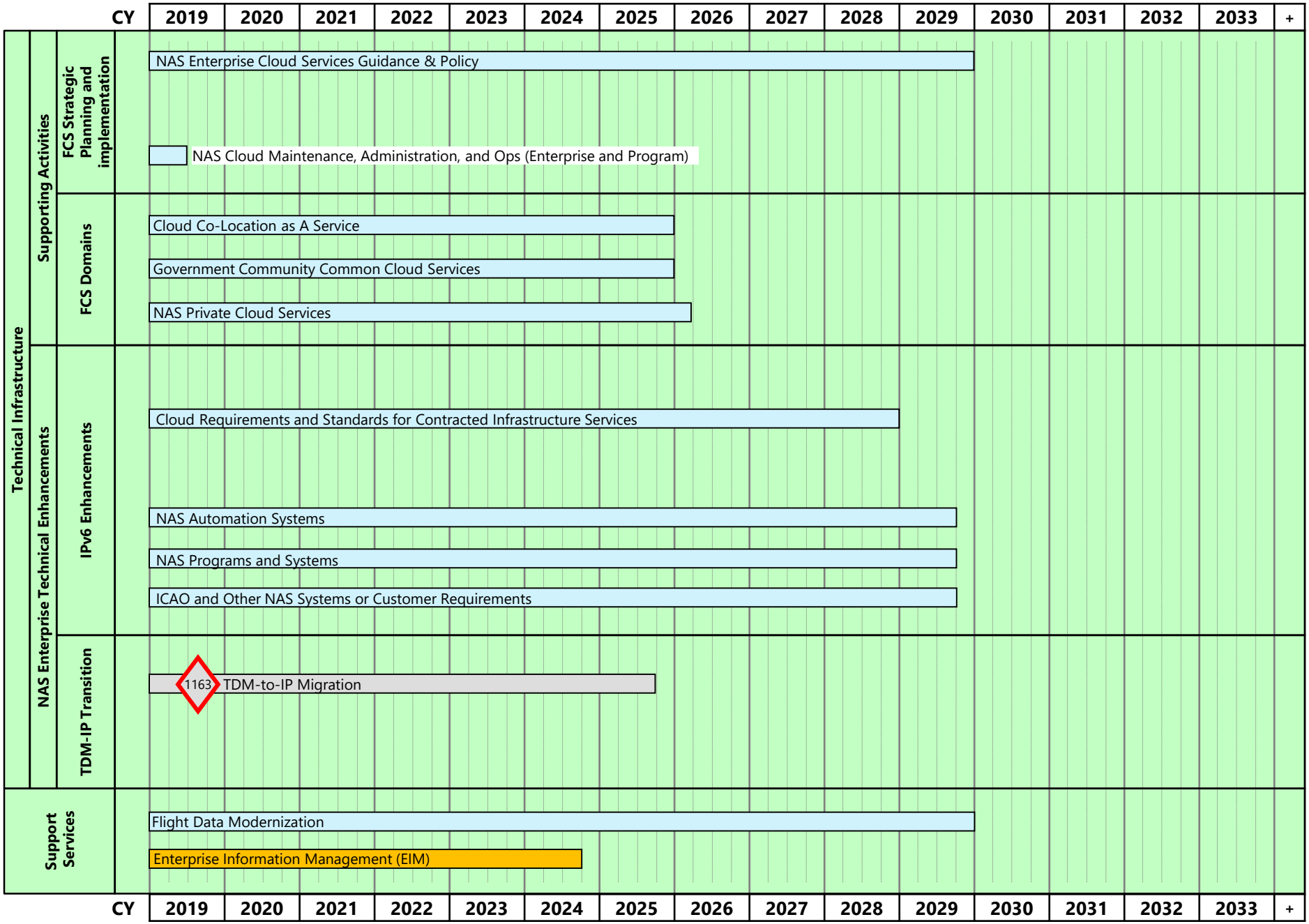
Enterprise Services Roadmap (2 of 4)



Enterprise Services Roadmap (3 of 4)



Enterprise Services Roadmap (4 of 4)



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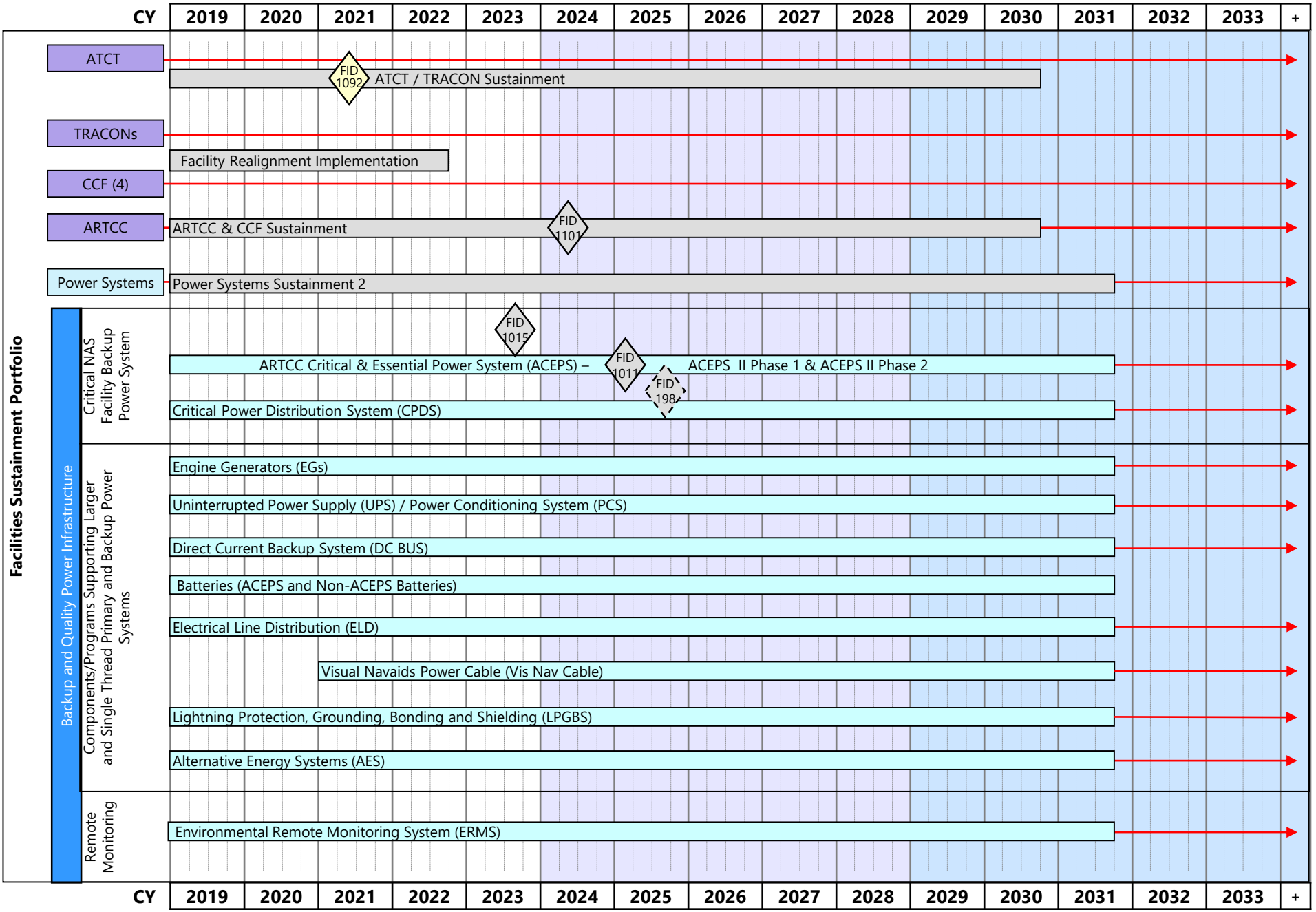
Enterprise Services Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
122	2020 Q1	No	Automation	FID	Final Investment Decision (FID) for AIMM Enhancement 1
341	2022 Q2	No	Weather	FID	Final Investment Decision (FID) for CSS-Wx Enhancement 1 and transition of ADAS communications (and WMSCR Comms if not completed in CSS-Wx) to CSS-Wx Enhancement 1
696	2020 Q2	No	Automation	FID	Final Investment Decision (FID) for AMMS
1075	2022 Q4	No	Automation	FID	Final Investment Decision (FID) for Common Support Services - Flight Data
1123	2020 Q1	No	Communication	FID	Final Investment Decision (FID) for SWIM Segment 2C, NEMS TR and 3rd Party Provider Services
1163	2019 Q3	Yes	Communication	Strategy (Other)	TDM-to-IP Portfolio Strategy Decision
1210	2019 Q3	No	Communication	Strategy (JRC)	Strategy Decision for SWIM 2C Scope Expansion
1218	2023 Q1	No	Communication	FID	Final Investment Decision (FID) for SWIM Segment 3
1221	2020 Q4	No	Communication	FID	Final Investment Decision (FID) for Enhanced SWIM Cloud Service

Facilities

Objective: The Facilities roadmap depicts the legacy NAS facilities and the evolution towards the NextGen Future Facilities environment.

Facilities Roadmap (1 of 4)



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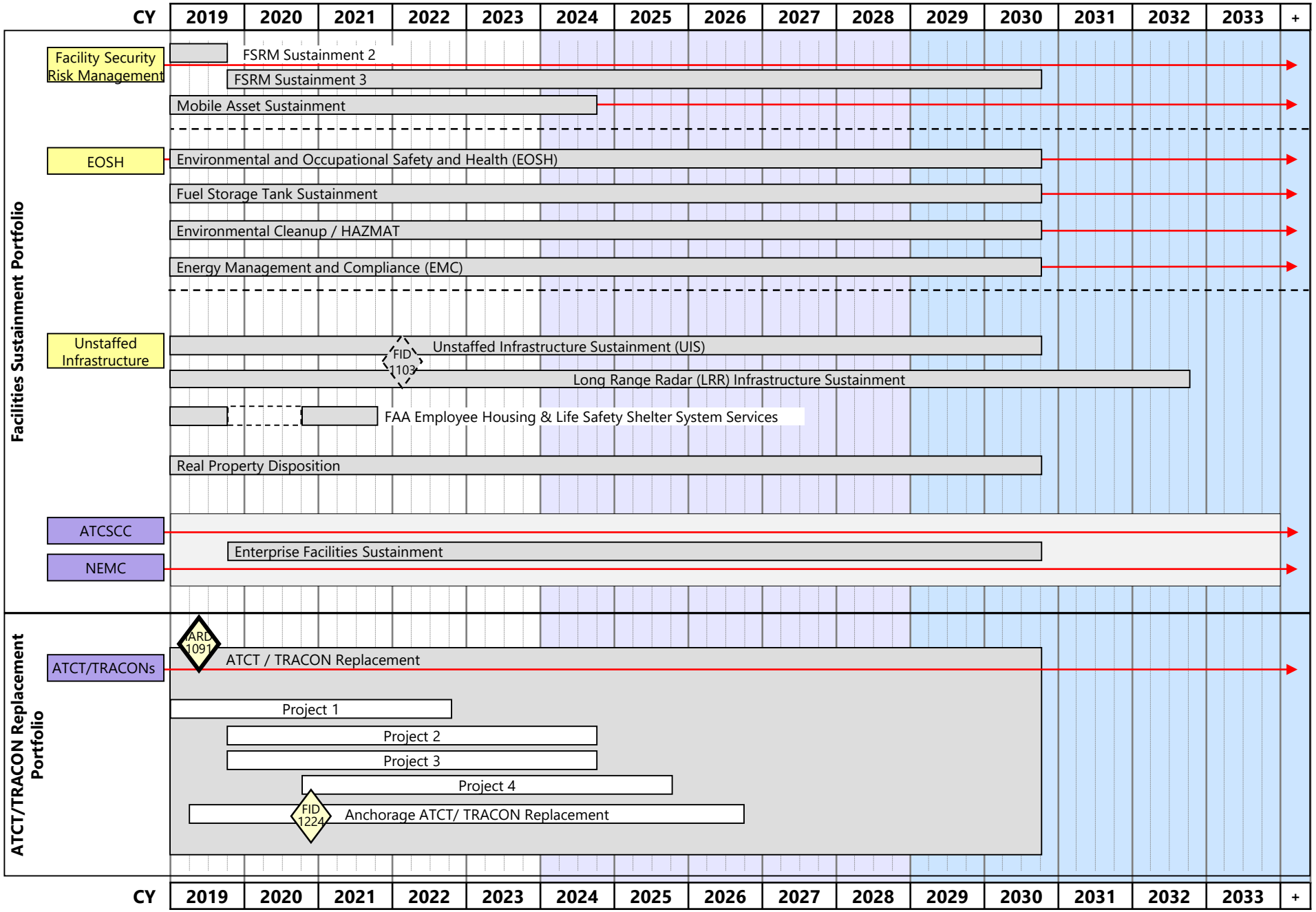
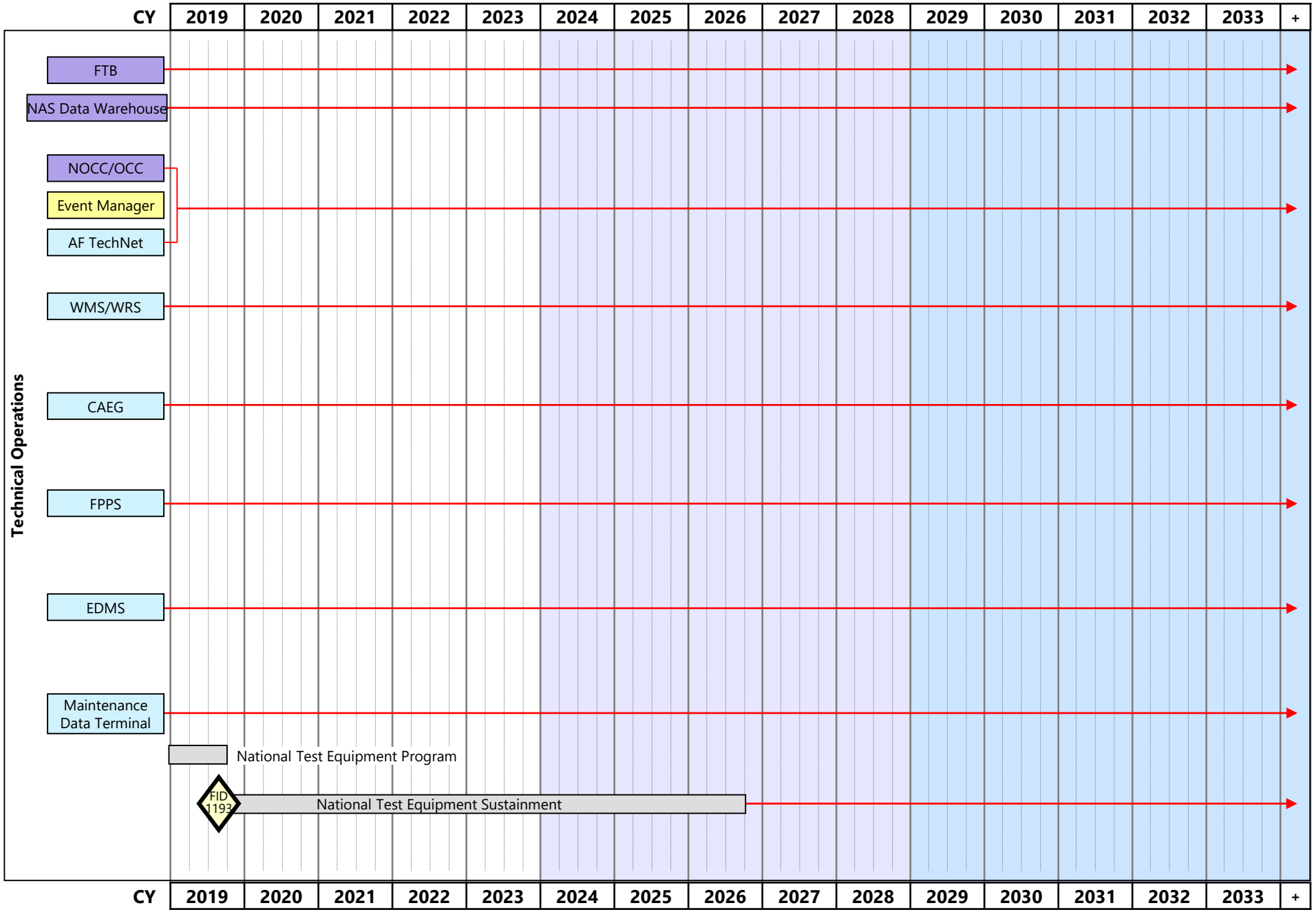
Facilities Roadmap (2 of 4)



Facilities Roadmap (3 of 4)



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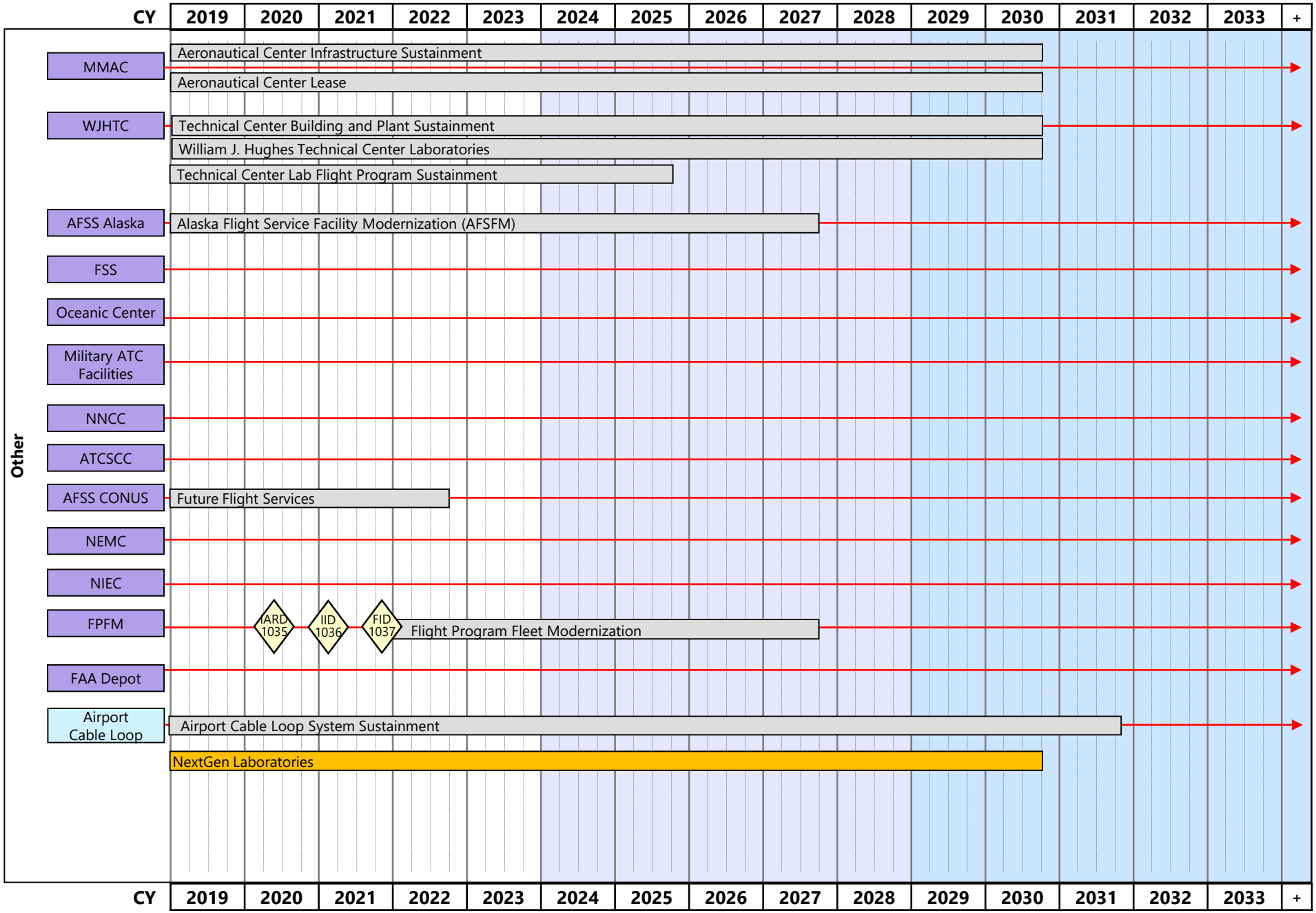
Facilities Roadmap (4 of 4)



Facilities Roadmap: Assumptions

Identifier	Description
FAC-01	AJW-2 will need funding for any facilities or infrastructure projects to expand or improve a facility in preparation for a PMO program installation. Refurbish requirements at Large TRACONs and new facilities may be needed to support BA positions. AJW-2 should receive funding and requirements documentation at least 3 years in advance, preferably 4 years, to integrate the project into the Sustainment or New Investment portfolio workplan.

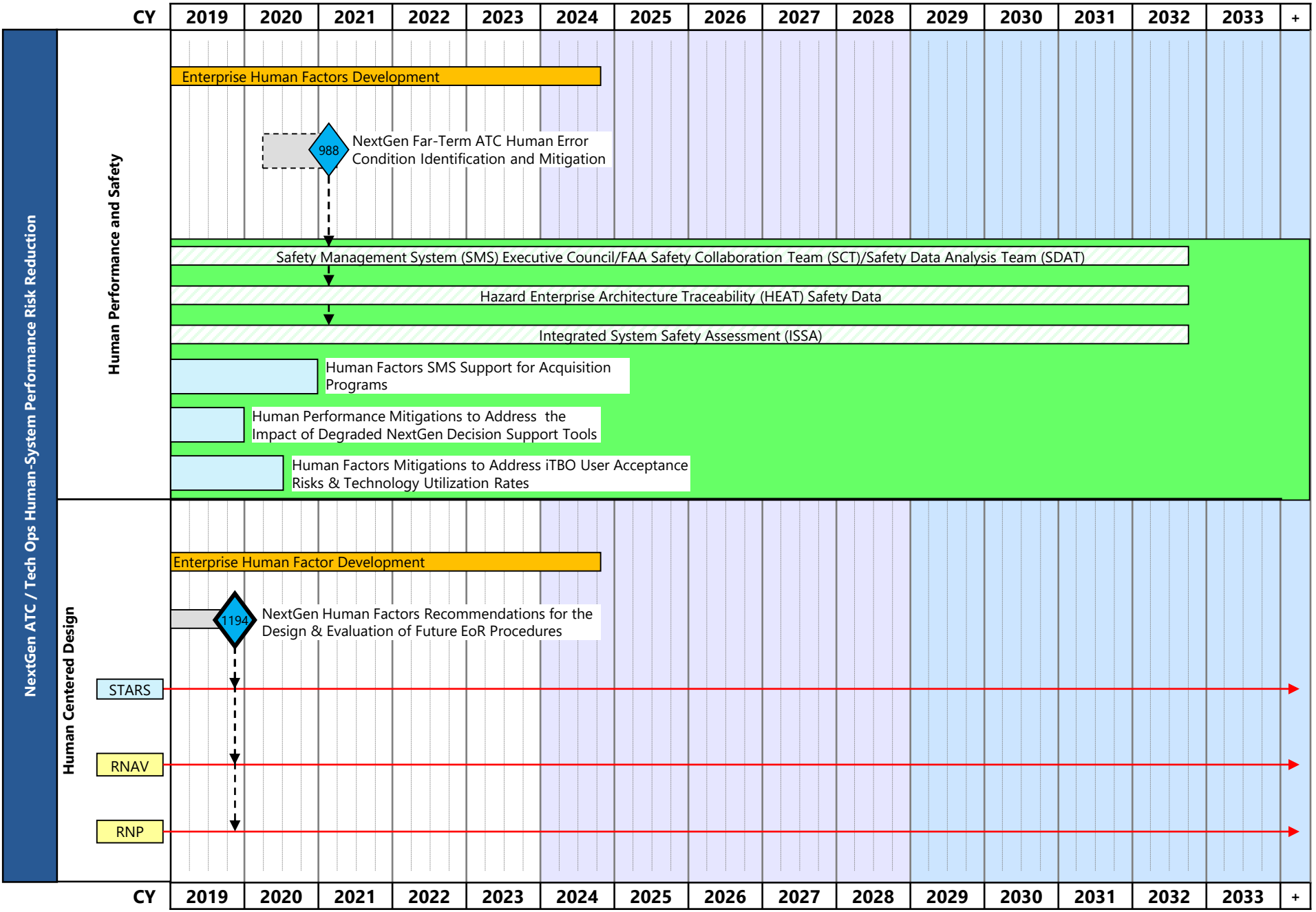
Facilities Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
198	2025 Q3	No	Automation	FID	Final Investment Decision (FID) for TFDM Enhancement
1011	2025 Q1	No	Automation	FID	Final Investment Decision (FID) for ERAM Sustainment 4
1015	2023 Q3	No	Automation	FID	Final Investment Decision (FID) for ERAM Enhancement 3
1035	2020 Q2	No	Facilities	IARD	Investment Analysis Readiness Decision (IARD) for Flight Program Fleet Modernization
1036	2021 Q1	No	Facilities	IID	Initial Investment Decision (IID) for Flight Program Fleet Modernization
1037	2021 Q4	No	Facilities	FID	Final Investment Decision (FID) for Flight Program Fleet Modernization
1091	2019 Q2	No	Facilities	IARD	Investment Analysis Readiness Decision (IARD) for ATCT/TRACON Replacement Portfolio
1092	2021 Q2	No	Facilities	FID	Final Investment Decision (FID) for New York TRACON (N90) Sustainment
1101	2024 Q2	No	New Entrants - UAS	FID	Final Investment Decision (FID) for UAS Enhancement 1
1103	2022 Q1	No	Surveillance	FID	Final Investment Decision (FID) for SENSR
1193	2019 Q3	No	Facilities	FID	Final Investment Decision (FID) for National Test Equipment Sustainment
1224	2020 Q4	No	Facilities	FID	Final Investment Decision (FID) for Anchorage (A11) ATCT/TRACON Replacement

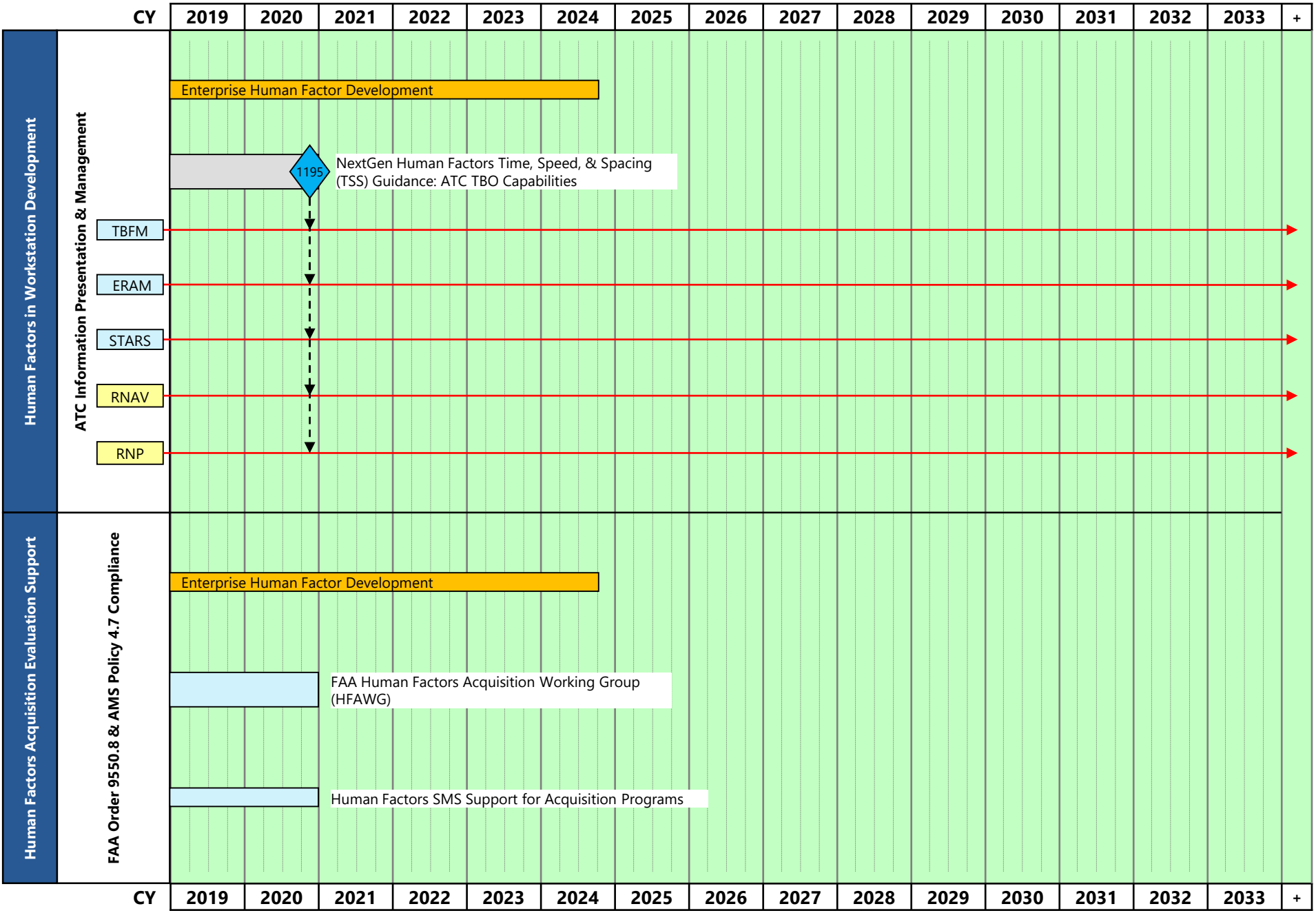
Human Systems Integration

Objective: The Human Systems Integration (HSI) Roadmap represents strategic air-ground human factors activities and their direct contributions to the evaluation, development, and evolution of NAS infrastructure. The HSI Roadmap depicts the integration of these activities with cross-cutting NAS infrastructure improvements to identify key human factors product transition points. The HSI Roadmap drives the execution of critical path activities by providing timely human factors inputs to NAS infrastructure investments and related programs.

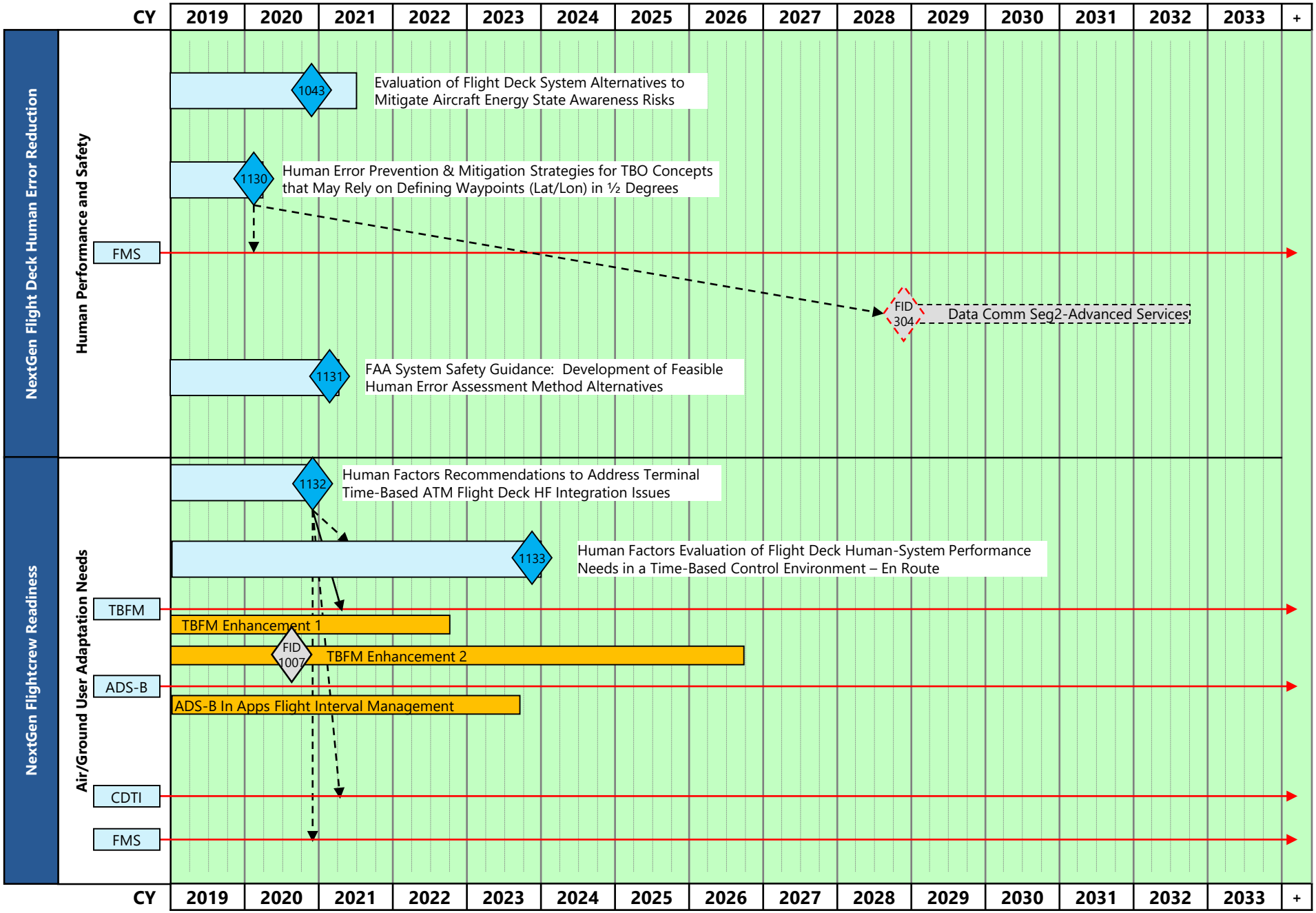
Human Systems Integration Roadmap (1 of 4)



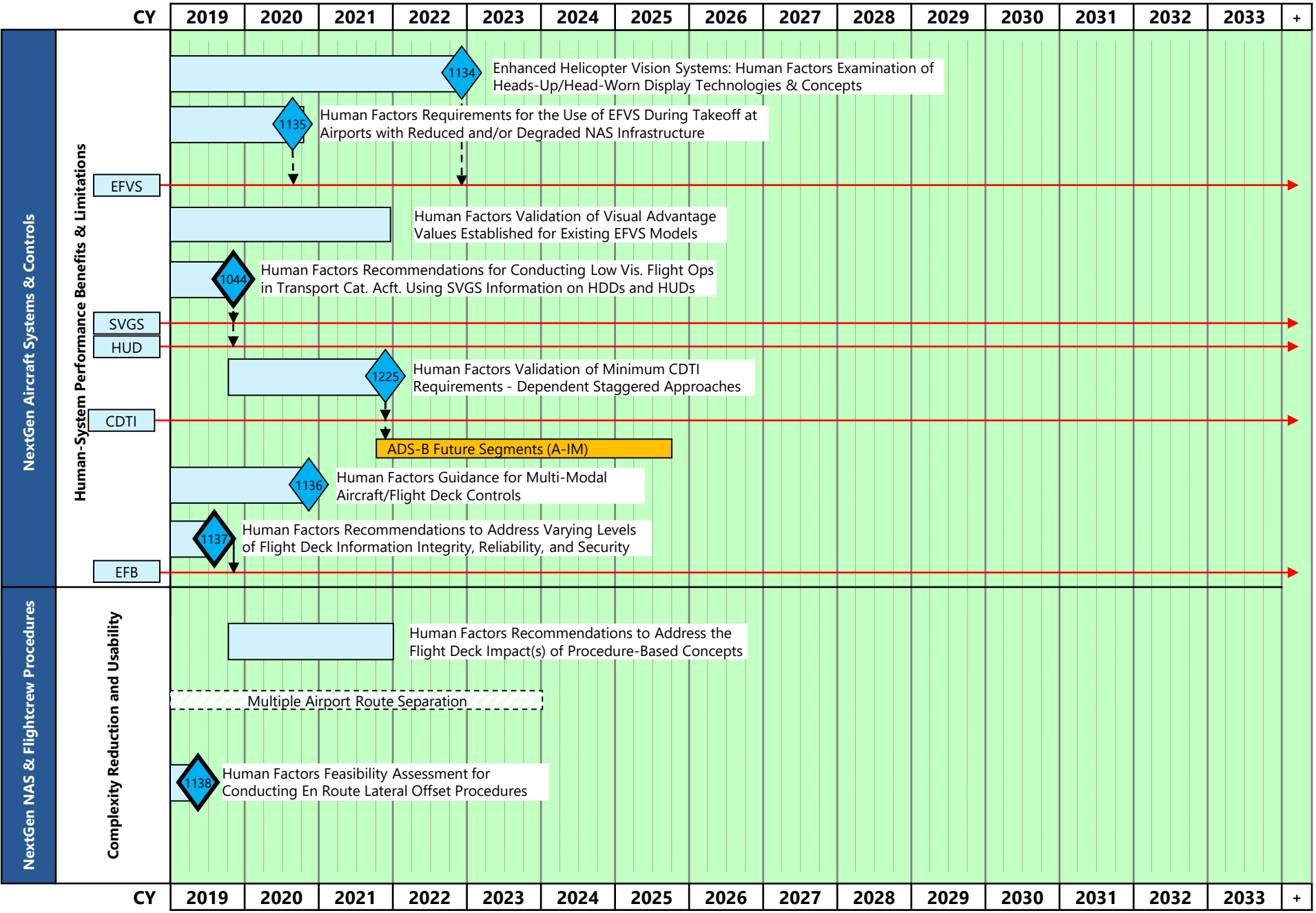
Human Systems Integration Roadmap (2 of 4)



Human Systems Integration Roadmap (3 of 4)



Human Systems Integration Roadmap (4 of 4)



Human Systems Integration Roadmap: Assumptions

Identifier	Description
HSI-01	The execution of program- and project-specific human factors activities are not represented in the HSI Roadmap.
HSI-02	Human factors integration points represent an identified opportunity for acquisition and procedure development programs to apply specific human factors products.
HSI-03	Human factors integration points represent the final opportunity for acquisition and procedure development programs to apply specific human factors products.
HSI-04	Acquisition and procedure development programs will coordinate with ANG-C1 throughout AMS and other processes to identify and address human factors opportunities.
HSI-05	ANG-C1 will coordinate across programs to identify and address NAS-wide human factors opportunities.

Human Systems Integration Roadmap Summary

Human Factors Functions	NextGen Focus Areas / Activities	Infrastructure Development Influences
NextGen ATC/Tech Ops Human–System Performance Risk Reduction	**Human Performance and Safety** 988 **Human Centered Design** 1194	• Allocation of functions between users and automation • Mitigation of human error conditions arising from the introduction of complex systems and procedures • Definition of operational human-system performance criteria • Proactive derivation of out-year human performance and safety needs
Human Factors in Workstation Development	**ATC Information Presentation & Management** 1195	• Human factors system development standards and guidelines • Mitigation of human factors controller display issues • Identification of design impacts on user cognition and design alternatives • Prioritized cross-domain information and display convergence opportunities
Human Factors Acquisition Evaluation Support	**FAA Order 9550.8 & AMS Policy 4.7 Compliance**	• Implementation of HF tools, processes, and requirements for inclusion in AMS • Human factors evaluation of acquisition program requirements and SMS products
NextGen Flight Deck Human Error Reduction	**Human Performance and Safety** 1043 1130 1131	• Proactively detects and responds to flight deck technology shortfalls/gaps that could increase the opportunity for human error • Data-driven inputs to requirements, guidance, and best practices used to assess NextGen technologies/systems for human error tolerance • Support technology design reviews, down-selection of alternatives, and FAA response to emerging flight deck human-system interface/interaction issues
NextGen Flightcrew Readiness	**Air-Ground User Adaptation Needs** 1132 1133	• Identify and respond to strategic air-ground user adaptation needs to support the successful implementation, use, and acceptance of NextGen changes • Address the impacts of emerging technologies and procedures on flightcrew task management needs • Respond to gaps in FAA regulatory and training guidance to enable the evaluation of new NextGen pilot knowledge, skills, and abilities
NextGen Aircraft Systems and Controls	**Human-System Performance Benefits & Limitations** 1134 1135 1044 HF 01 1136 1137	• Evaluate human-system performance benefits & limitations of emerging flight deck technologies, systems, and controls • Respond to HF issues that may arise when combining NextGen aircraft changes with legacy technologies, systems, controls & their respective mode(s) of operations • Close regulatory & guidance material gaps that do not address new aircraft equipment, functions, & procedures required for NextGen
NextGen NAS & Flightcrew Procedures	**Complexity Reduction and Usability** 1138	• Mitigate operational integration issues that could result from the implementation of NextGen NAS procedures & advanced flight deck separation management concepts • Assess the feasibility of NextGen procedure design alternatives and potential impacts to human performance

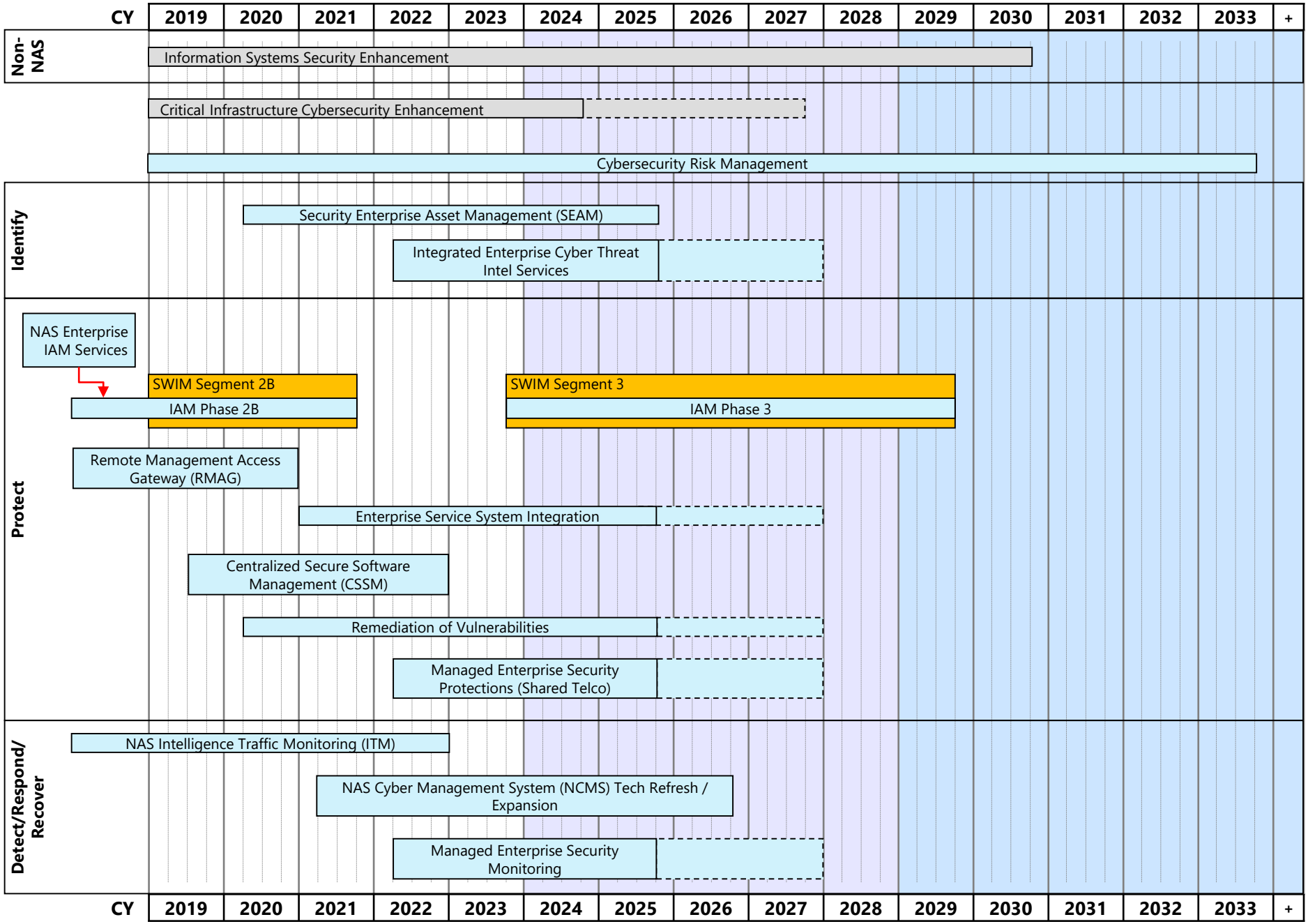
Human Systems Integration Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
304	2028 Q4	No	Communication	FID	Final Investment Decision (FID) for Data Comm Segment 2
988	2021 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Post-Bravo ATC Human Performance Safety Requirements into the NextGen Safety Process
1007	2020 Q3	No	Automation	FID	Final Investment Decision (FID) for TBFM Enhancement 2
1043	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval & Implementation Strategy of Human Factors Aircraft Energy State Display and Alerting Guidelines
1044	2019 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Human Factors SVGS Guidelines
1130	2020 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval & Implementation Strategy of HF Guidance for the Presentation of ½ Degree Waypoints to Users
1131	2021 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors System Safety Guidance
1132	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Mid-Term Time-Based ATM Enhancements
1133	2023 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Far-Term Time-Based ATM Enhancements
1134	2022 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Helicopter Advanced Vision Systems
1135	2020 Q3	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for the Use of EFVS During Departure Operations
1136	2019 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for the Design & Evaluation of Multi-Modal Controls
1137	2020 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for the Presentation of Flight Deck Information with Varying Levels of Reliability
1138	2020 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidance for Lateral Offset Procedures
1194	2019 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors NAS Procedure Design & Evaluation Guidelines
1195	2020 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Time, Speed, and Spacing (TSS) Guidelines
1225	2021 Q4	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors Guidelines for Minimum Cockpit Display of Traffic Information (CDTI) Requirements - Dependent Staggered Approaches

Information Systems Security

Objective: The Information Systems Security roadmap represents the evolution of existing or planned information security services and capabilities to protect NAS systems and data from the continuous cyber threat. The roadmap depicts the information security-related services from the Enterprise Services Roadmap and the supporting policy development activities, feasibility studies, and prototypes to enable the ISS capabilities.

Information Systems Security Roadmap (1 of 2)



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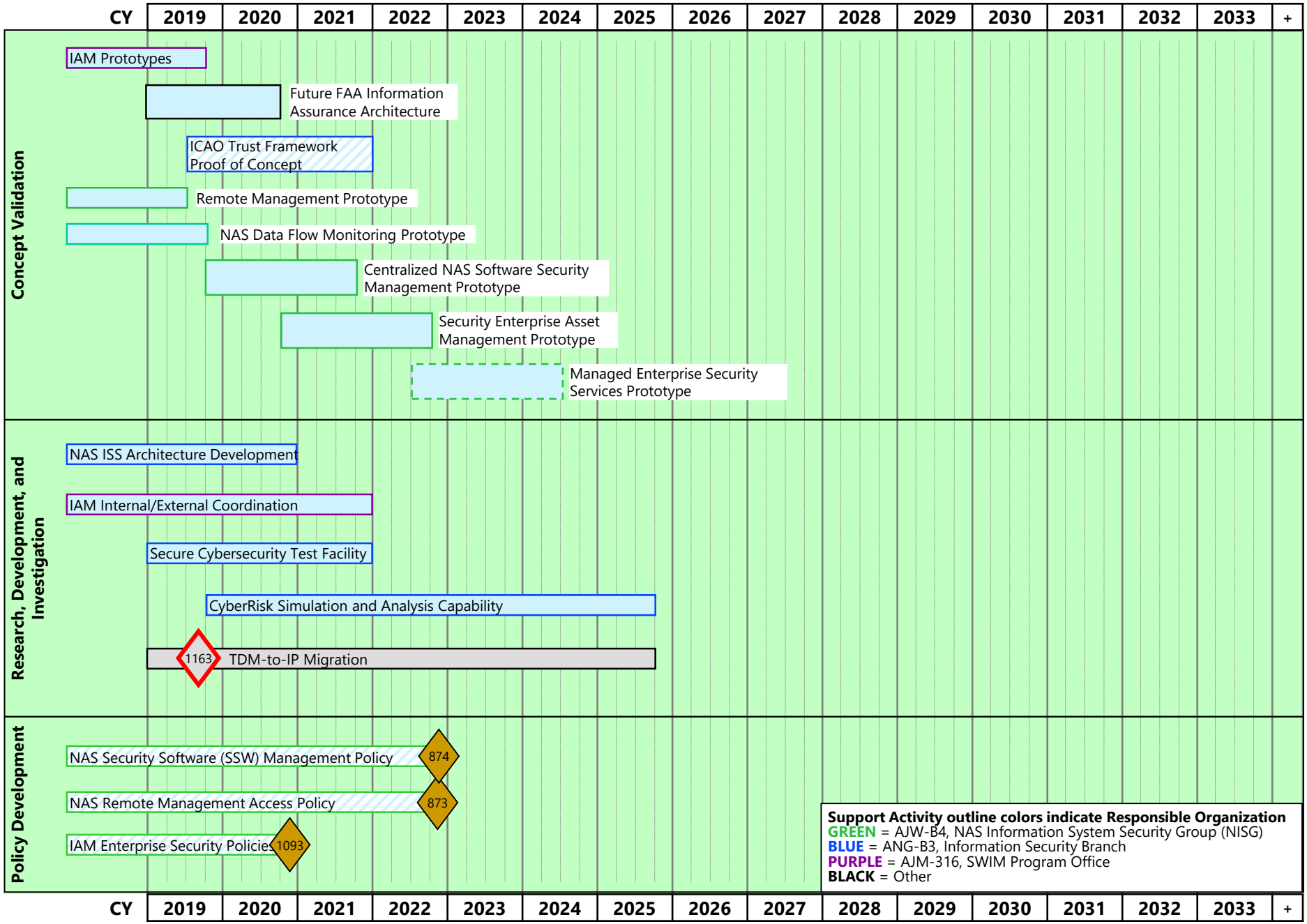
Information Systems Security Roadmap (2 of 2)



Information Systems Security Roadmap: Descriptions (1 of 3)

ISS Services	Enterprise Data Functions/ Business Services Provided	Summary of Functions and Business Services
Identify	Asset Management; Business Environment; Governance; Risk Assessment; and Risk Management Strategy	Develop the organizational understanding to manage cybersecurity risk to systems, assets, data, and capabilities.
Protect	Identity Management and Access Control; Awareness and Training; Data Security; Information Protection Processes and Procedures; Maintenance; and Protective Technology	Develop and implement the appropriate safeguards to ensure delivery of critical infrastructure services.
Detect	Anomalies and Events; Security Continuous Monitoring; and Detection Processes	Develop and implement the appropriate activities to identify the occurrence of a cybersecurity event.
Respond	Response Planning; Communications; Analysis; Mitigation; and Improvements	Develop and implement the appropriate activities to take action regarding a detected cybersecurity event.
Recover	Recovery Planning; Improvements; and Communications	Develop and implement the appropriate activities to maintain plans for resilience and to restore any capabilities or services that were impaired due to a cybersecurity event.

Information Systems Security Roadmap: Descriptions (2 of 3)

Service Name	Service Definition
Security Enterprise Asset Management (SEAM)	This service will provide a centralized collection and analysis capability for NAS asset hardware, software, vulnerability, and configuration information to support ISCM and meet OMB 14-03, Phase 1.
Integrated Enterprise Cyber Threat Intel Services	Establish Next Phase of Emerging Cyber Capabilities from CyTF to protect against evolving threats to new NAS technologies, Transition to a more automated FAA Information Security Continuous Monitoring Posture, and Improve Incident Detection, Response, and Recovery Processes
NAS Identity and Access Management (IAM)	IAM consists of the following NAS IAM Services: 1. Enterprise Authorization Service (IAMEAS). Phase 2 provides the NAS with the capability to review, authorize and manage privileges for systems accessing NAS data or publishing data for NAS use. 2. Enterprise Directory Service (IAMDS). Provides a high-performance secure Light Weight Directory Access Protocol (LDAP) and X.500 standards based server implemented to store policy, attributes and business rules. 3. Registration Authority Enrollment Portal Service (IAMRA) – Provides NAS Non Peron Entity Certificates for NAS programs where required by ATO Policy. 4. Validation Service (IAMVS) – Provides PKI credential validation services where required by ATO Policy. 5. Security Token Service (IAMSTS) – Provides SAML 2.0 Standards based security token issuance and validation services.
Remote Management Access Gateway (RMAG)	Boundary Protection Services to improve the cyber security posture of the NAS by enhancing controls used to provide secure operational access to NAS assets from external domains; providing a layered defense-in-depth approach for accessing NAS assets via a secure gateway infrastructure. This will support operational access needs while preventing unauthorized entities and data flows from reaching the NAS critical infrastructure
Enterprise Service System Integration - RMAG	This investment will provide system funding to ensure utilization of F&E funded enterprise NAS security services (such as RMAG) in providing system identification, protection, detection, and response/recovery capabilities.
Centralized NAS Software Security Management (CSSM)	Improve the cyber security posture of the NAS by providing a centralized capability for security patch and malicious code protection updates; establish a standard secure method to access critical security configuration updates; and reducing the risk of security compromise. This will support a more reliable and resilient operating NAS infrastructure.
Remediation of High Priority NAS System Vulnerabilities	This investment provides the Critical Infrastructure Cybersecurity program needed flexibility to address weaknesses in NAS F&E funded systems across the ATO that are identified via findings from multiple sources (e.g. Risk Assessments, GAO, OIG).

Information Systems Security Roadmap: Descriptions (3 of 3)

Service Name	Service Definition
Managed Enterprise Security Protections (Shared Telco)	This investment will provide managed active protection security services at NAS facility network boundaries to support use of shared carrier Wide Area Network services to be implemented under the FAA Enterprise Network Services (FENS) program.
NAS Intelligence Traffic Monitoring (ITM)	Planned Improvement & Enhancements related to the NAS Infrastructure aimed at improving the cyber security posture via increasing situational awareness for the operational NAS cyber security monitoring capability; enables full monitoring coverage of data flows (internal and external) through implementation of cyber security sensors throughout the NAS thereby enhancing modeling and detection of anomalous data flow activities. This supports a proactive versus reactive cyber security response , fostering actions geared to minimizing potential impacts to ATC operations.
NAS Cyber Management System (NCMS) Site Expansion / Tech Refresh	This investment will provide an expansion and technology refresh for the centralized NAS system security event capture and monitoring service. This initiative will expand existing NCMS services by implementing additional hardware and software within the NAS internal operating environment and integrating NAS assets with the service.
Managed Enterprise Security Monitoring	This investment will provide managed passive monitoring security services at NAS facility network boundaries to support use of shared carrier Wide Area Network services to be implemented under the FAA Enterprise Network Services (FENS) program.

Information Systems Security Roadmap: Assumptions

Identifier	Description
ISS-01	Funding for the Critical Infrastructure Cybersecurity Enhancement RPD ends in FY2024; however, several activities are expected to extend to FY2026.

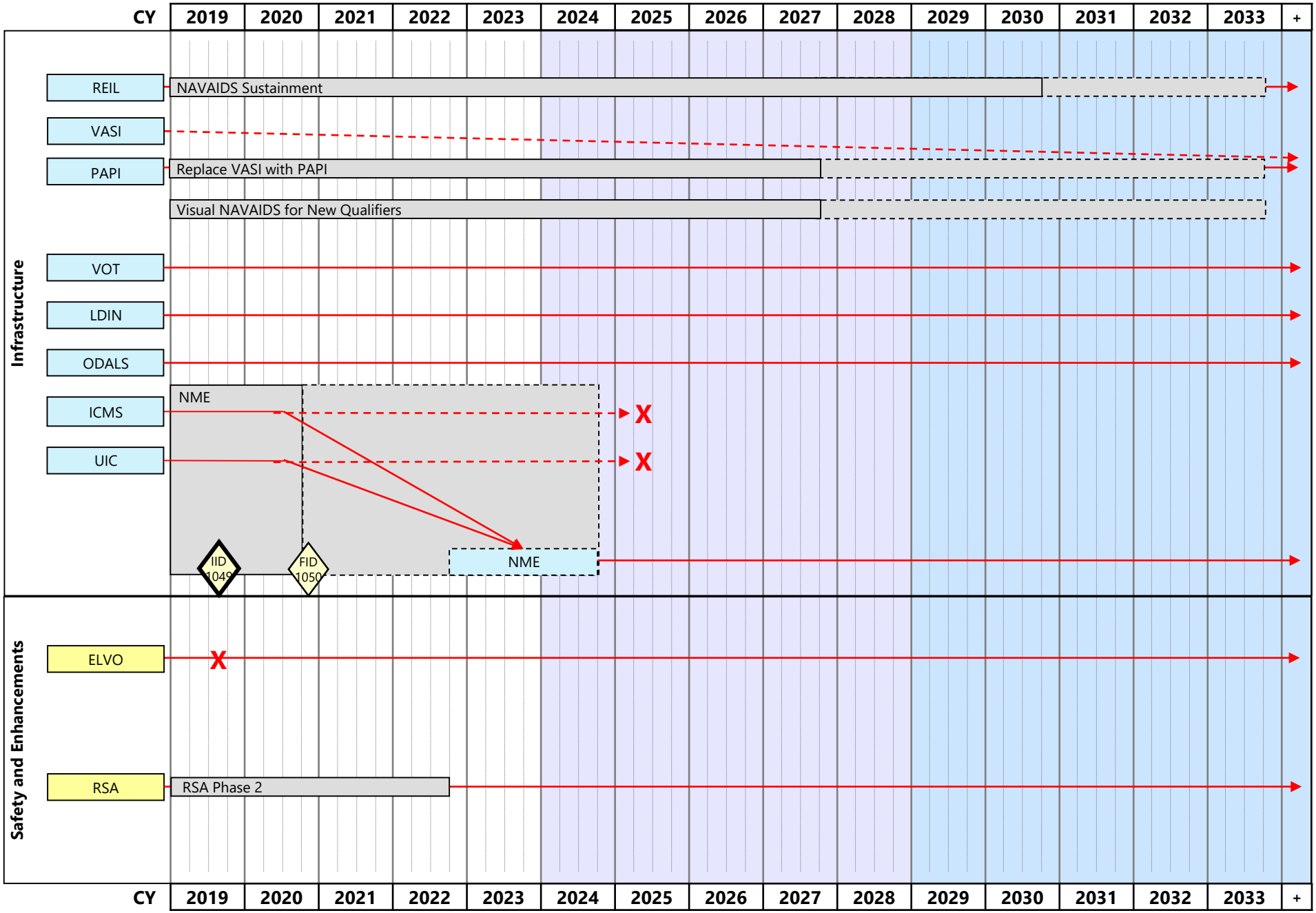
Information Systems Security Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
873	2022 Q4	No	ISS	Policy	NAS Remote Management Access Policy Decision
874	2022 Q4	No	ISS	Policy	NAS Security Software (SW) Management Policy Decision
1093	2020 Q4	No	ISS	Policy	Decision to Approve IAM Authorization Policy
1163	2019 Q3	Yes	Communication	Strategy (Other)	TDM-to-IP Portfolio Strategy Decision

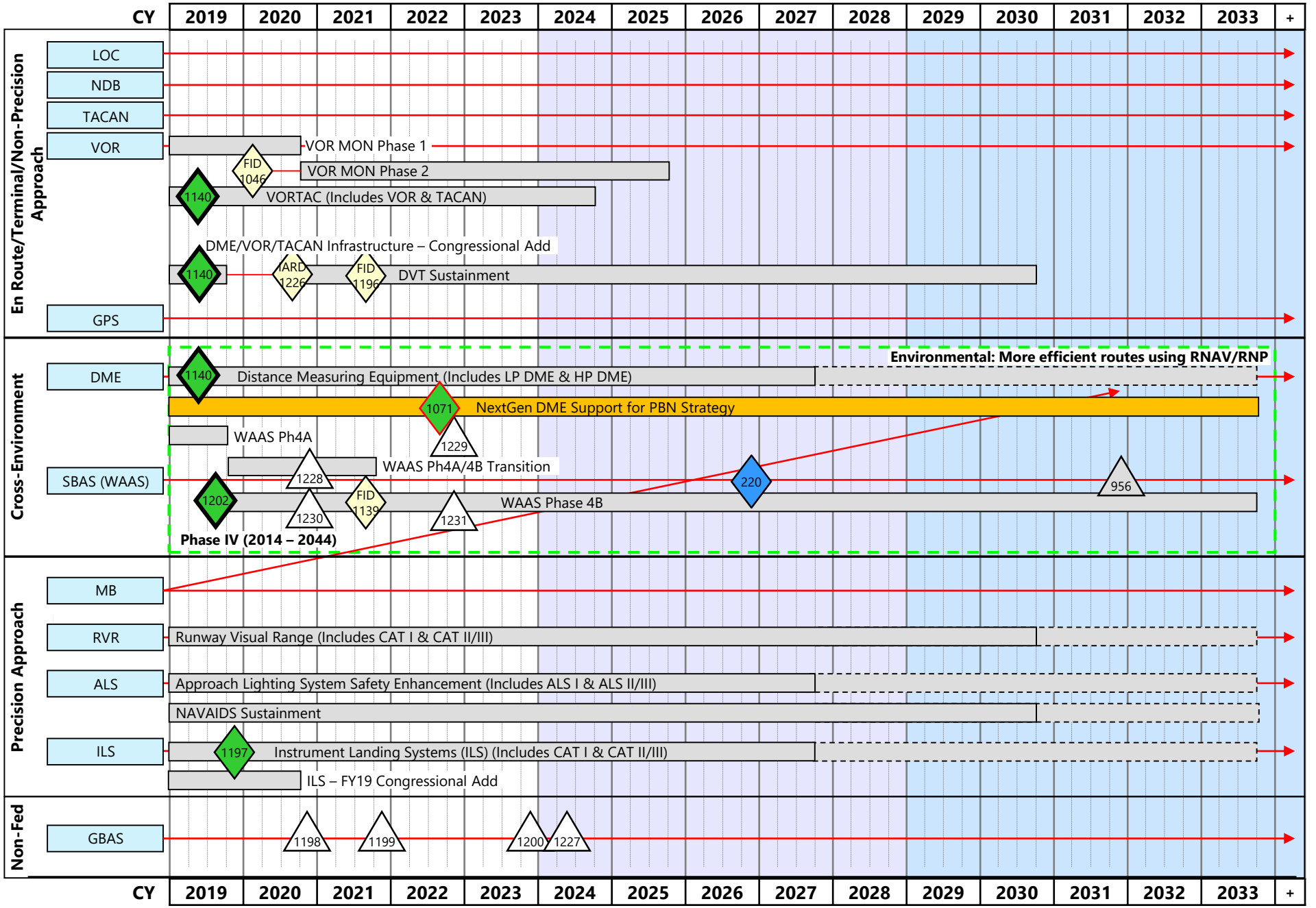
Navigation

Objective: The Navigation roadmap depicts the sustainment and evolution of ground-based and satellite-based navigation systems to support Performance-Based Navigation (PBN) in the NextGen environment.

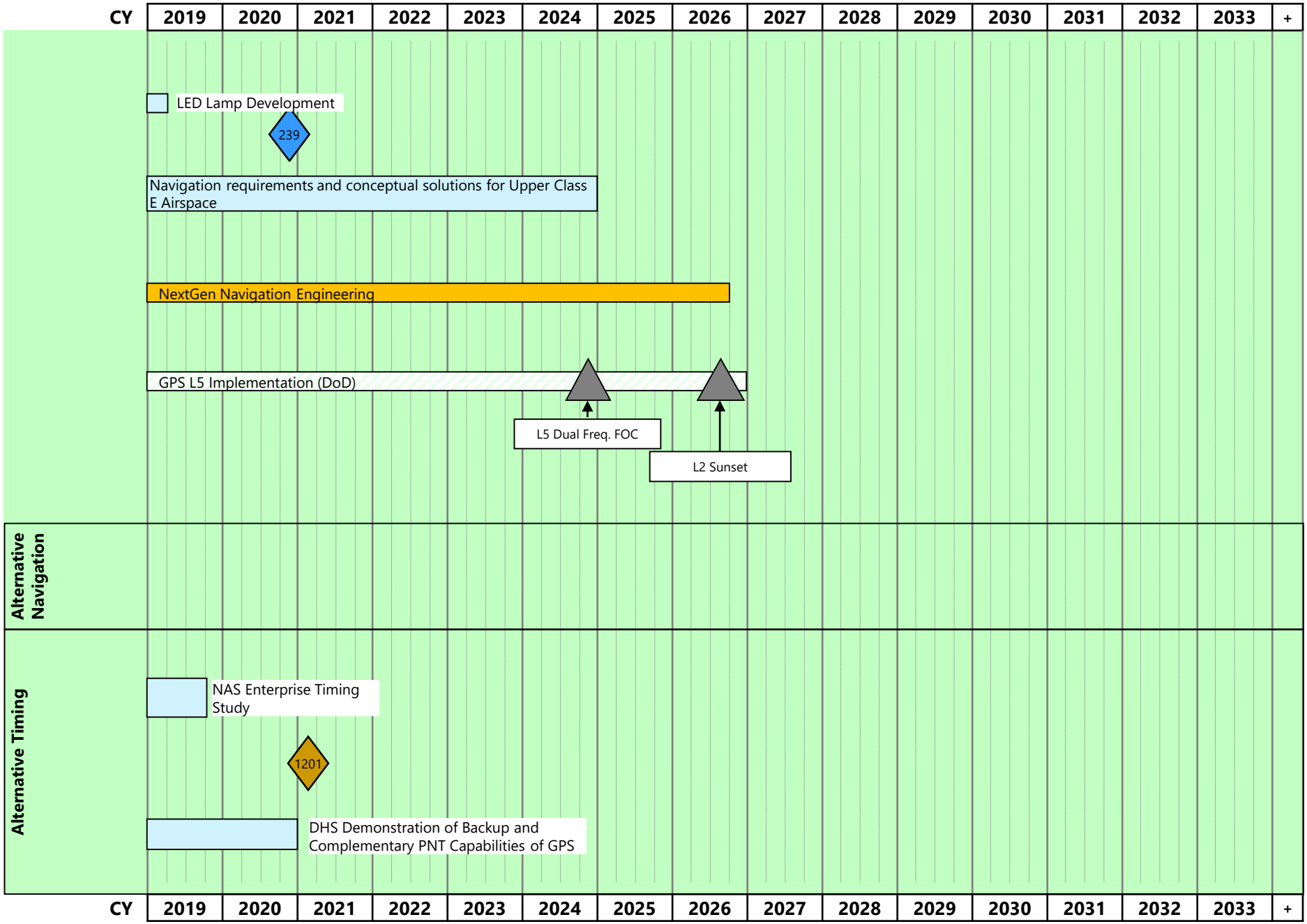
Navigation Roadmap (1 of 3)



Navigation Roadmap (2 of 3)



Navigation Roadmap (3 of 3)



Navigation Roadmap: Assumptions (1 of 2)

Identifier	Description
NAV-01	FAA is transitioning to a PBN centric NAS, where PBN is used for daily operations. PBN is comprised of RNAV and RNP for en route, terminal, and approach & landing domains. This will include: a) Transition from VOR-defined routes to GNSS and DME-DME RNAV for en route and terminal. b) Transition from CAT I ILS to GNSS for approach and landing. c) Reduce existing DME coverage gaps for en route and terminal domains.
NAV-02	NextGen implementation requires an aggressive transition to services that support Performance-Based Navigation (PBN). This requires: a) Navigation Strategy to be fully aligned with the FAA's PBN Strategy, which will provide: 1. A clear statement regarding the need and eligibility of navigation services for airports and airspace 2. Close collaboration with the aviation stakeholders
NAV-03	Need to continue working closely with users and the avionics industry on equipage issues to support transition to a PBN-centric NAS a) The PBN Strategy provides for PBN services that encourages voluntary equipage. b) Equipage will be in place to support transition to PBN
NAV-04	PBN strategy includes the need for a resilient navigation infrastructure to maintain safety, security, and capacity and preclude significant economic impact during GNSS outages. This includes: a) Maintaining a VOR MON to ensure en route and approach capabilities during GNSS disruptions for aircraft that are unable to continue RNAV operations. b) Sustain a sufficient number of ILSs to landing in IMC during GNSS disruptions. c) En route and terminal DME RNAV coverage will support navigation to an ILS or VOR approach for aircraft not equipped with inertial capability.
NAV-05	FAA has no current plan to acquire Federal GBAS systems. GBAS installations will depend on individual airports' interest and investment.
NAV-06	Department of Defense will maintain a GPS constellation consistent with the Standard Positioning Service.

Navigation Roadmap: Assumptions (2 of 2)

Identifier	Description
NAV-07	Navigation Roadmap page 2 of 3 breaks the infrastructure up by phases of flight supported. ‘Cross Environment’ applies to all phases of flight.

Navigation Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
220	2026 Q4	No	Navigation	Strategy (Other)	Decision to Cut Over to Dual Frequency / Multi-Constellation Operations Based on Completion of Dual Frequency (GPS L1 and L5) Development & Testing
239	2020 Q4	No	Navigation	Strategy (Other)	Strategy Decision to Proceed with ALS (I) Production LED Lamps for MALSR Systems
956	2031 Q4	No	Aircraft	Regulatory Milestone	Publication of SBAS Dual-Frequency/Multi-Constellation (DFMC) MOPS
1046	2020 Q1	No	Navigation	FID	Final Investment Decision (FID) for VOR MON Implementation - Phase 2
1049	2019 Q3	No	Navigation	IID	Initial Investment Decision (IID) for NAVAIDS Monitoring Equipment
1050	2020 Q4	No	Navigation	FID	Final Investment Decision (FID) for NAVAIDS Monitoring Equipment
1071	2022 Q3	Yes	Navigation	Strategy (JRC)	Strategy Decision to Proceed with Segment 3 of NextGen DME Support for PBN Strategy
1139	2021 Q3	No	Navigation	FID	Final Investment Decision (FID) for Wide-Area Augmentation System (WAAS) Phase 4B
1140	2019 Q2	No	Navigation	Strategy (JRC)	Strategy Decision for the Supportability of Distance Measuring Equipment (DME) Very High Frequency Omni-Directional Range (VOR) Tactical Air Navigation (TACAN) [DVT]
1196	2021 Q3	No	Navigation	FID	Final Investment Decision for the Supportability of Distance Measuring Equipment (DME) Very High Frequency Omni-Directional Range (VOR) Tactical Air Navigation (TACAN) [DVT]
1197	2019 Q4	No	Navigation	Strategy (JRC)	ILS Rationalization Strategy Decision
1198	2020 Q4	No	Navigation	Regulatory Milestone	GAST-E/F ICAO SARPS
1199	2021 Q4	No	Navigation	Regulatory Milestone	GAST-E/F RTCA MOPS - Initial Draft
1200	2023 Q4	No	Navigation	Regulatory Milestone	GAST-E/F RTCA MOPS - Final Draft
1201	2021 Q1	No	Navigation	Policy	NAS Enterprise Timing Requirements
1202	2019 Q3	No	Navigation	Strategy (JRC)	Strategy Decision for WAAS Phase 4B #1
1226	2020 Q3	No	Navigation	IARD	Investment Analysis Readiness Decision (IARD) for DVT Sustainment
1227	2024 Q2	No	Navigation	Regulatory Milestone	GBAS Dual-Frequency Multi-Constellation Standards for Applicability
1228	2020 Q4	No	Navigation	Regulatory Milestone	SBAS L1/L5 MOPS Part 1
1229	2022 Q4	No	Navigation	Regulatory Milestone	SBAS L1/L5 MOPS Part 2

Navigation Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1230	2020 Q4	No	Navigation	Regulatory Milestone	SBAS L1/L5 SARPS Part 1
1231	2022 Q4	No	Navigation	Regulatory Milestone	SBAS L1/L5 SARPS Part 2

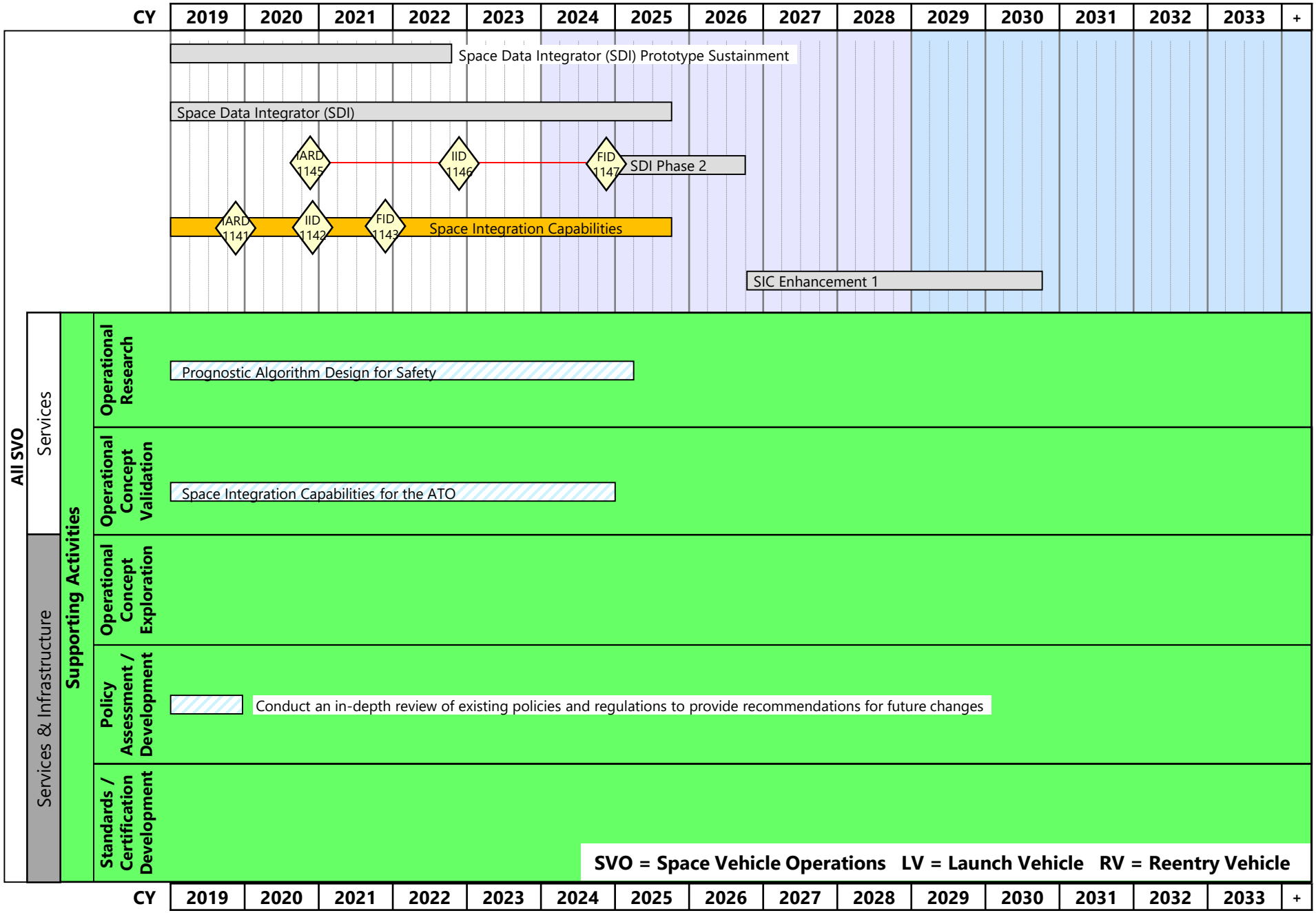
New Entrants

Objective: The New Entrants roadmap provides a consolidated timeline of activities and investments, both active and planned, required to integrate UAS and Commercial Space into the NAS.

New Entrants – Commercial Space

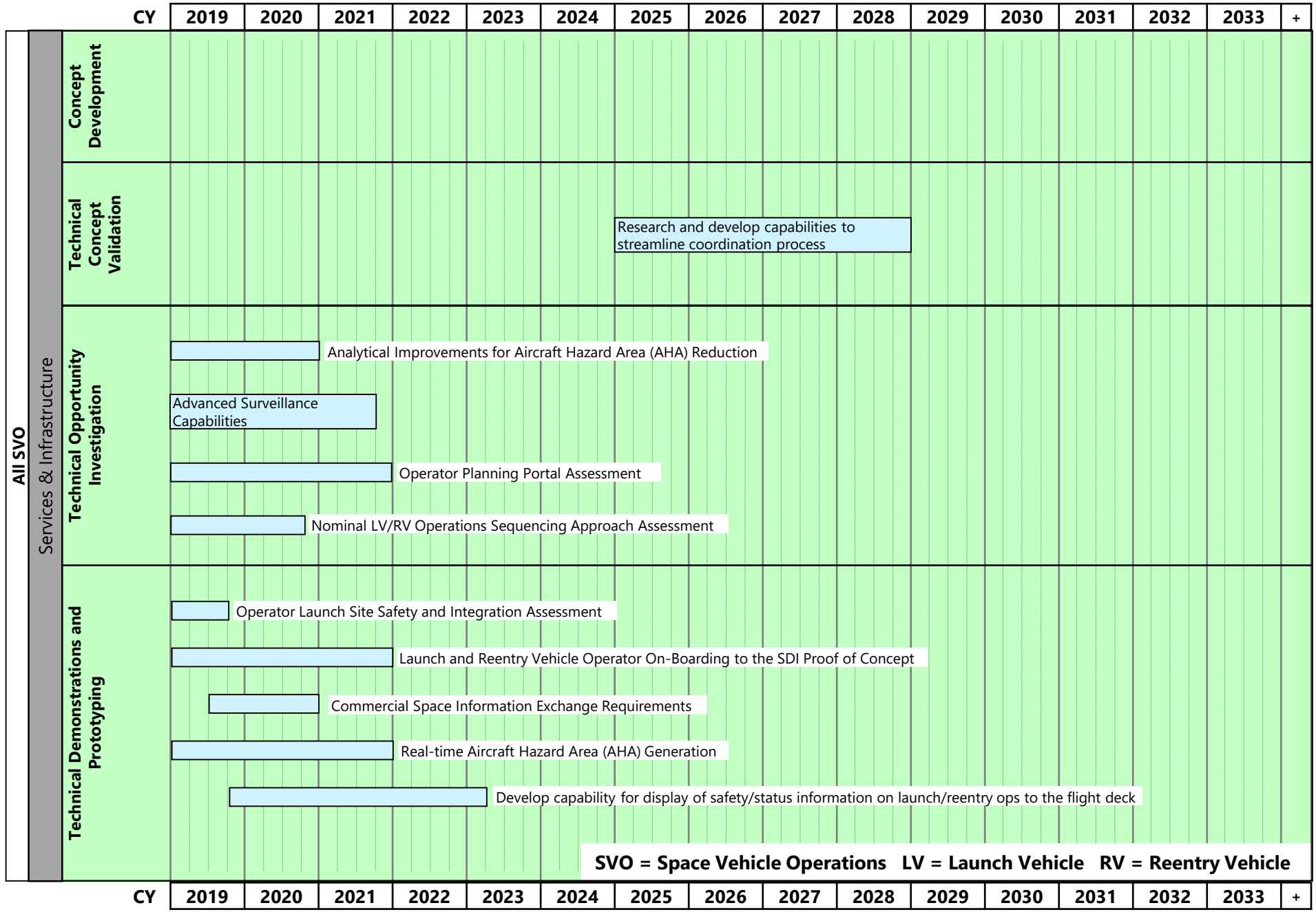
Objective: The New Entrants Commercial Space Roadmap presents an Executive View (EV) of the current systems supporting the National Airspace System (NAS) and their enhancement, sustainment or replacement through major development programs and support activities. The Commercial Space Roadmap is intended to convey the major program strategy and acquisition decision points as well as program execution through the In-Service Decision. The roadmap serves as a summary view of more detailed plans within each development program.

New Entrants – Commercial Space Roadmap (1 of 2)



BASELINE

New Entrants – Commercial Space Roadmap (2 of 2)



New Entrants – Commercial Space Roadmaps: Assumptions

Identifier	Description
CS-01	1) The implementation of SDI is dependent on the ability of TFMS to handle the additional workload. 2) SIC Phase 2 will include, but not be limited to, outputs from Support Activities that are deemed necessary, but are not ready for SIC Phase 1.
CS-02	Space Traffic Management – In the future, the FAA will need to be involved with STM, but the scope of that work has not yet been defined and won't be until at least 2021.

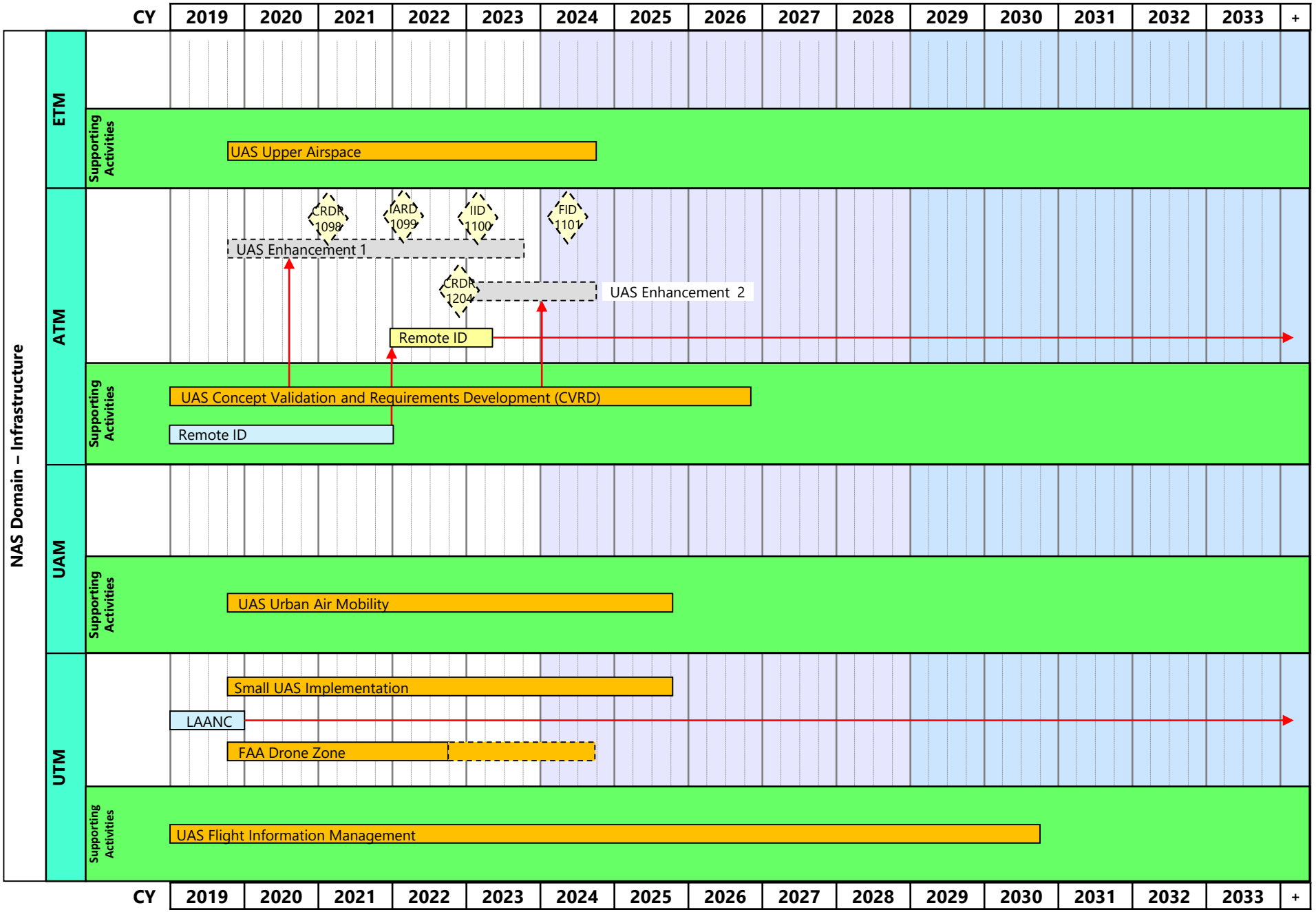
New Entrants – Commercial Space Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1141	2019 Q4	No	New Entrants - Commercial Space	IARD	Investment Analysis Readiness Decision (IARD) for Space Integration Capabilities
1142	2020 Q4	No	New Entrants - Commercial Space	IID	Initial Investment Decision (IID) for Space Integration Capabilities
1143	2021 Q4	No	New Entrants - Commercial Space	FID	Final Investment Decision (FID) for Space Integration Capabilities
1145	2020 Q4	No	New Entrants - Commercial Space	IARD	Investment Analysis Readiness Decision (IARD) for Space Data Integrator (SDI) Phase 2
1146	2022 Q4	No	New Entrants - Commercial Space	IID	Initial Investment Decision (IID) for Space Data Integrator (SDI) Phase 2
1147	2024 Q4	No	New Entrants - Commercial Space	FID	Final Investment Decision (FID) for Space Data Integrator (SDI) Phase 2

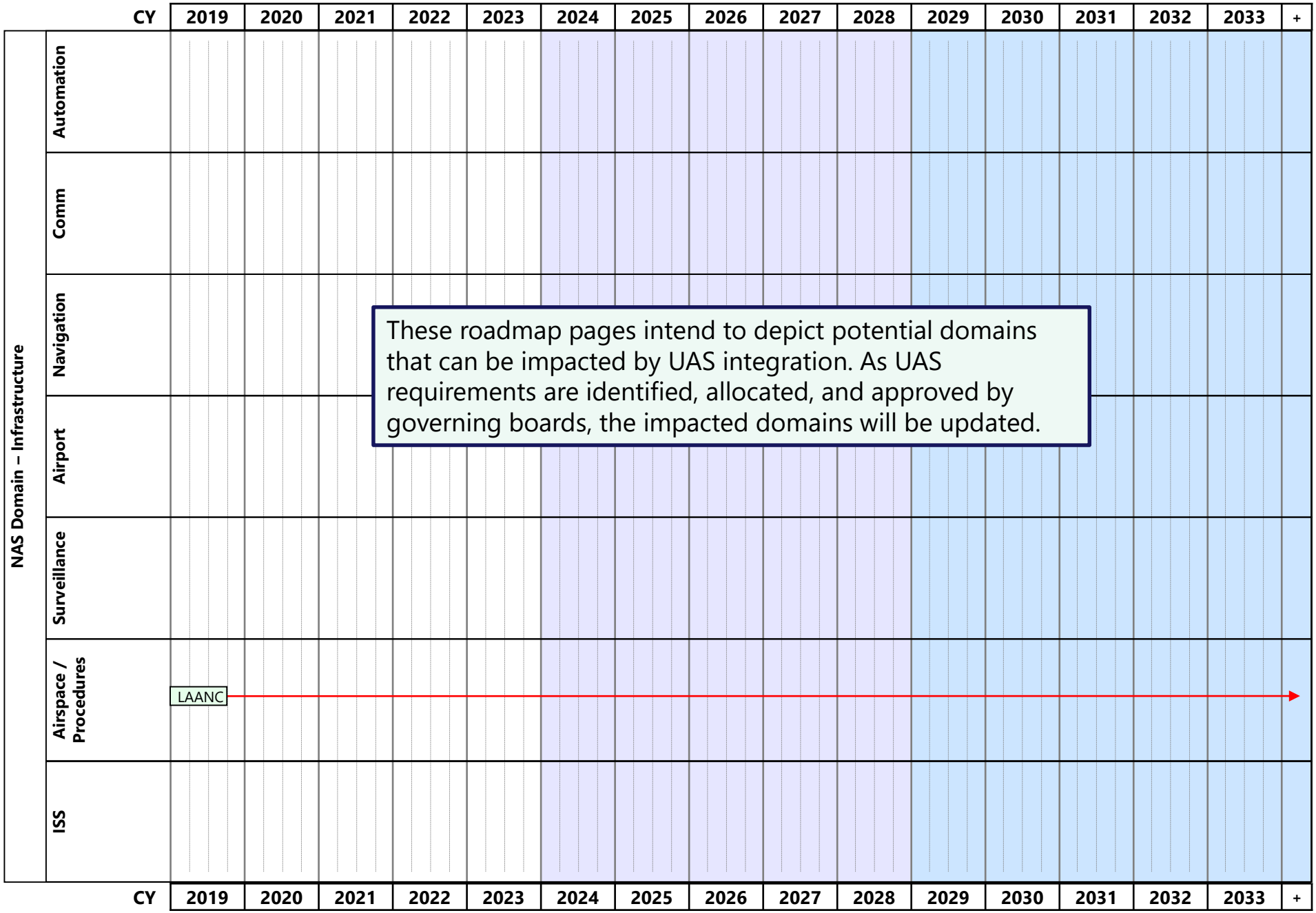
New Entrants – Unmanned Aircraft System

Objective: The Unmanned Aircraft Systems (UAS) Roadmaps provide a consolidated timeline of activities and investments, both active and planned, required to integrate UAS operations into the NAS. The current iteration of the roadmaps reflect initial pre-implementation efforts and AMS acquisitions. In the next few years, the FAA UAS community plans to coordinate with the program offices associated with impacted NAS systems and services currently identified and described in the "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap" (July 2018). Additionally, the FAA UAS community will collaborate with applicable program offices in requirements allocations decisions, which will be reflected in future versions of this roadmap.

New Entrants – UAS Roadmap (1 of 4)



New Entrants – UAS Roadmap (2 of 4)

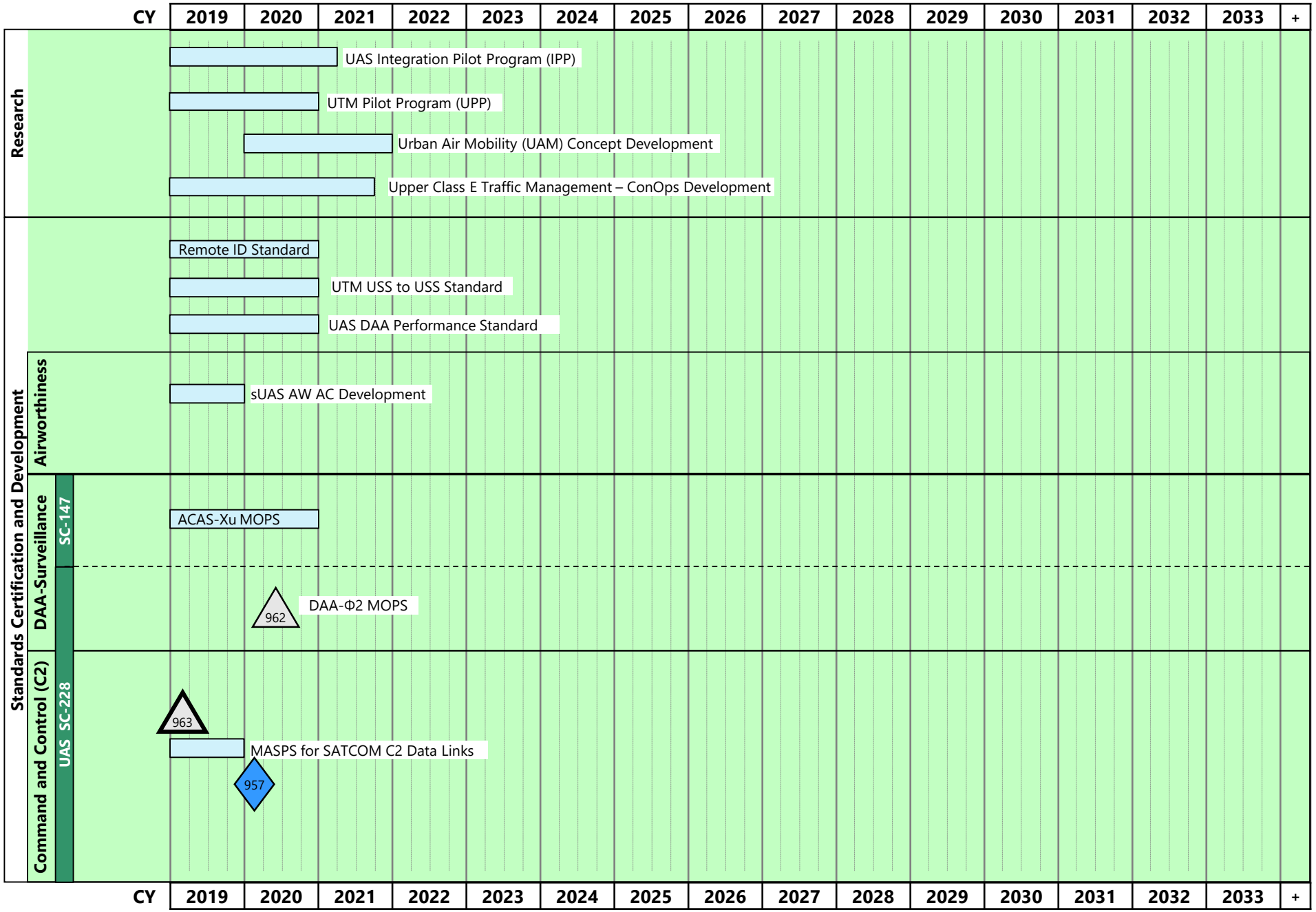


New Entrants – UAS Roadmap (3 of 4)

	CY	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	+
NAS Domain – Infrastructure	Safety																
	Weather																
	Aircraft																
	Enterprise Services																
	Facilities																
	HSI																
	Other																
	CY	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	+

These roadmap pages intend to depict potential domains that can be impacted by UAS integration. As UAS requirements are identified, allocated, and approved by governing boards, the impacted domains will be updated.

New Entrants – UAS Roadmap (4 of 4)



New Entrants – UAS Roadmap: Assumptions

Identifier	Description
UAS-01	The Authoritative references used to populate the CY2019 UAS roadmaps are: 1) "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap" (July 2018) 2) CIP data provided by AFN and Draft CIP FY 2020 – FY2024 3) UAS Integration Research Plan (2017 – 2022) 4) Other NAS Infrastructure Roadmaps 5) UAS Stakeholder inputs
UAS-02	Although impacted NAS systems are identified and documented in "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap" (July 2018), requirements allocations have not been discussed and accepted by the organizations that manage the impacted systems. Upon coordination and decisions made about UAS requirements allocation, ANG-B intends to update this roadmap to depict acquisitions that will deliver UAS-related requirements in the future.
UAS-03	Research and Development: The full scope of research and development activities are too numerous and complex to depict on this format of the roadmaps. Roadmap stakeholders are encouraged to reference pages 10, 35 and 38 of "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap" (July 2018) to understand the full scope of FAA UAS R&D efforts.

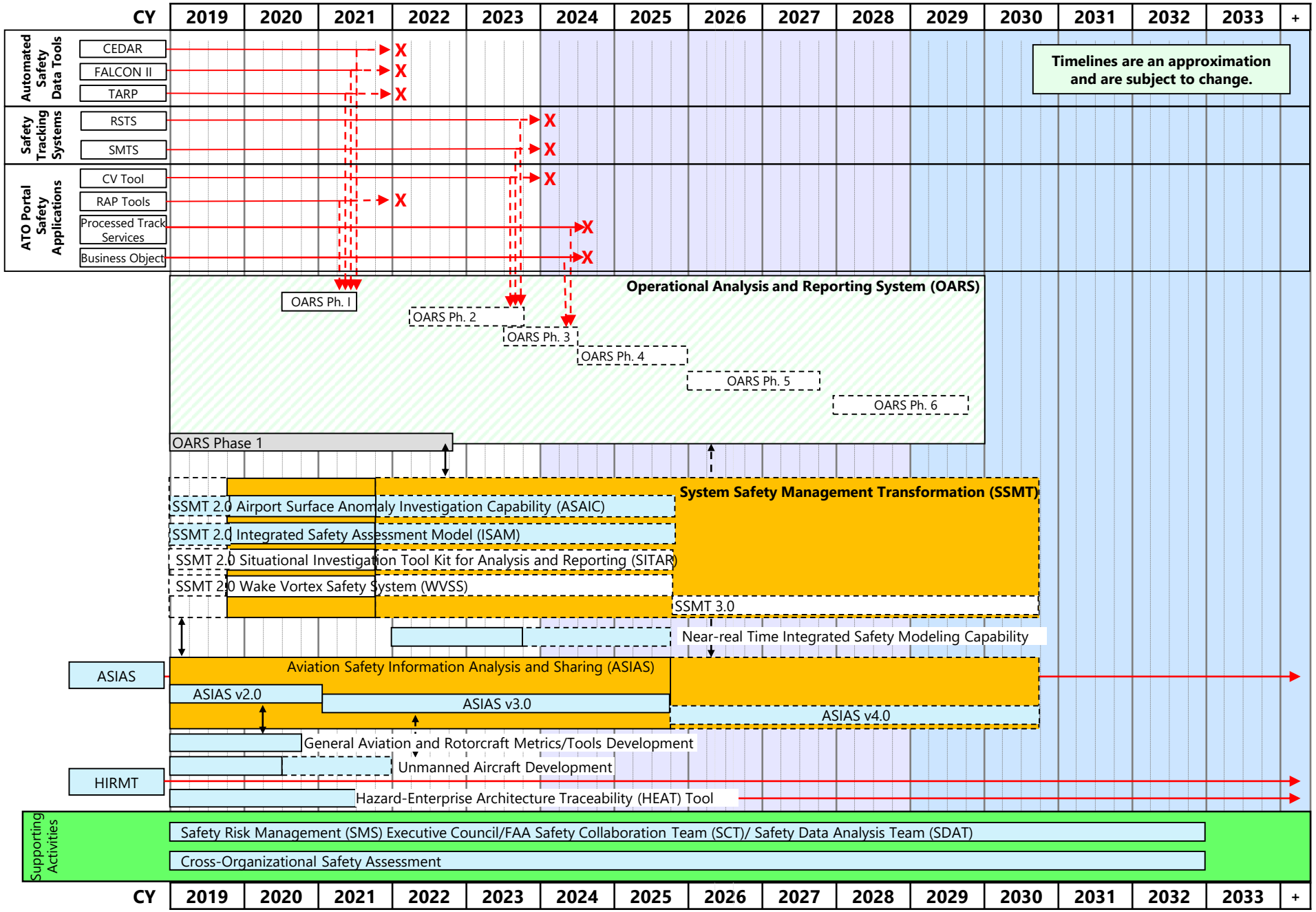
New Entrants – UAS Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
957	2020 Q1	No	New Entrants - UAS	Strategy (Other)	C2 Protected Spectrum Management and Allocation Systems Acquisition Strategy Determined
962	2020 Q2	No	Aircraft	Regulatory Milestone	Minimum Operational Performance Standards (MOPS) for UAS Detect and Avoid (DAA) - Phase 2 (SC-228)
963	2019 Q1	No	Aircraft	Regulatory Milestone	Advisory Circular (AC) Invoked for Command and Control for UAS Operations
1098	2021 Q1	No	New Entrants - UAS	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for UAS Enhancement 1
1099	2022 Q1	No	New Entrants - UAS	IARD	Investment Analysis Readiness Decision (IARD) for UAS Enhancement 1
1100	2023 Q1	No	New Entrants - UAS	IID	Initial Investment Decision (IID) for UAS Enhancement 1
1101	2024 Q2	No	New Entrants - UAS	FID	Final Investment Decision (FID) for UAS Enhancement 1
1204	2022 Q4	No	New Entrants - UAS	CRDR	Concept and Requirements Definition Readiness (CRDR) Decision for UAS Enhancements 2

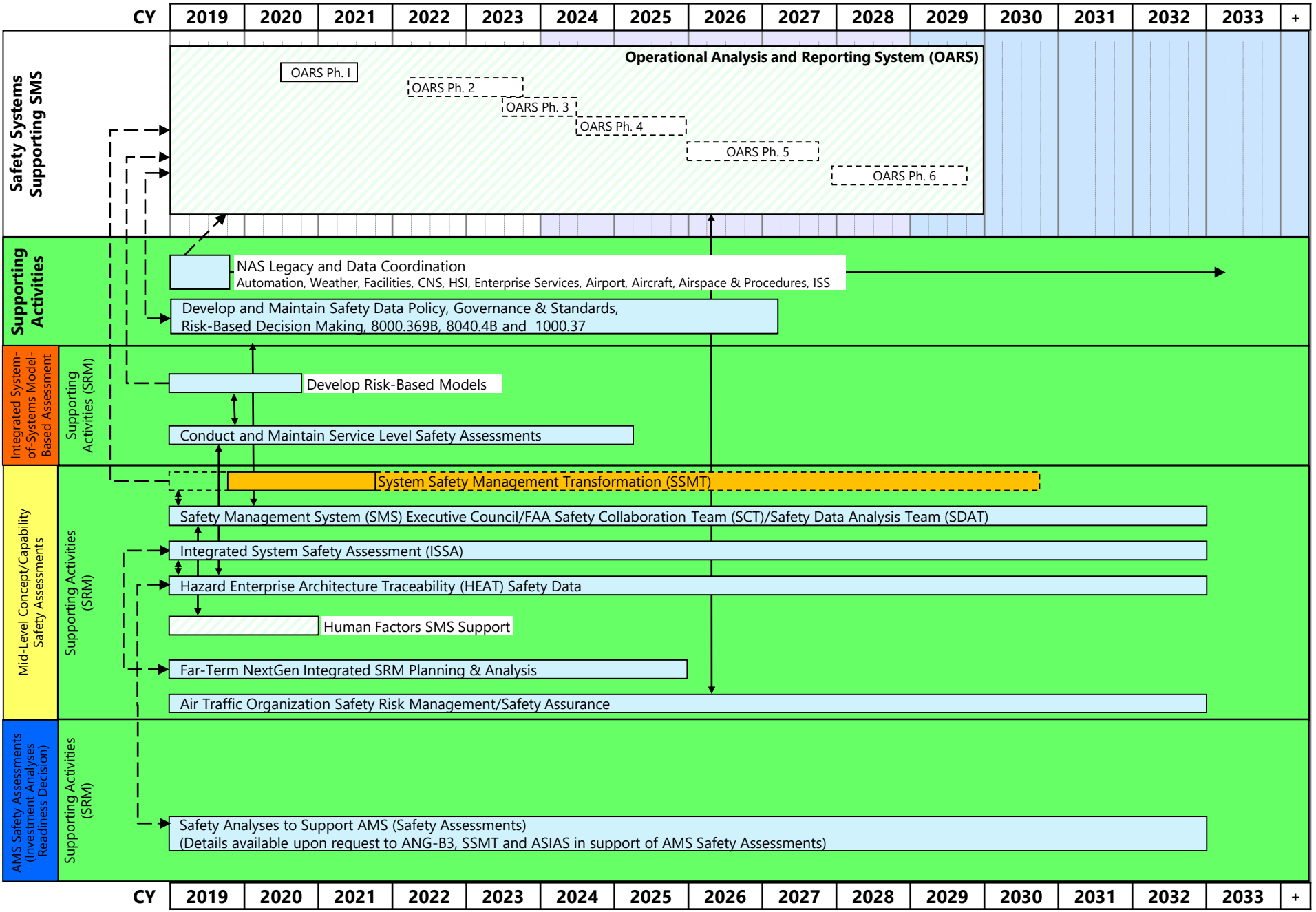
Safety

Objective: The Safety Roadmap reflects various aspects of the Safety Risk Management (SRM) process that support enterprise level, concept/capability level, and system level safety. It supports the execution of safety assessments on potential safety issues that span multiple FAA organizations, through cross-cutting stakeholder collaboration, and provides FAA decision-makers with pertinent information to make risk-based decisions. The Safety Roadmap integrates SRM elements with NAS operations and system acquisition milestones through the development of key safety assessments, procedures, guidance, policy and requirements that support the NextGen Enterprise System.

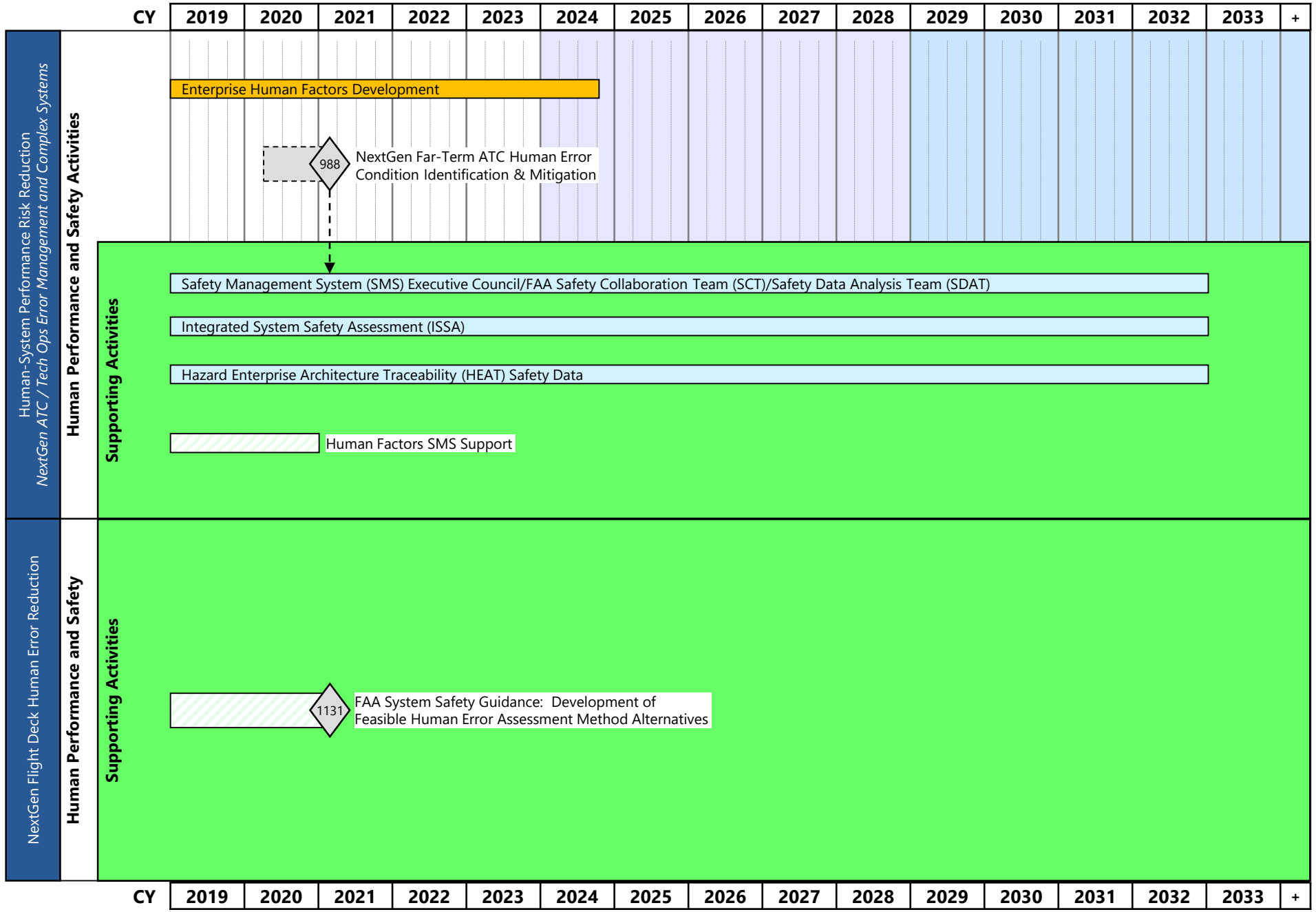
Safety Roadmap (1 of 3)



Safety Roadmap (2 of 3)



Safety Roadmap (3 of 3)



Safety Roadmap: Assumptions

Identifier	Description
SAFE-01	ASIAS is part of the FAA Mission Support EA. It is depicted on the Safety Infrastructure Roadmap for coordination purposes since: a) It will require NAS data. b) It will provide safety data and tools for the NAS
SAFE-02	SMS Implementations for other LOBs are part of the FAA Mission Support EA. These activities are depicted on the Safety Infrastructure Roadmap for coordination purposes.

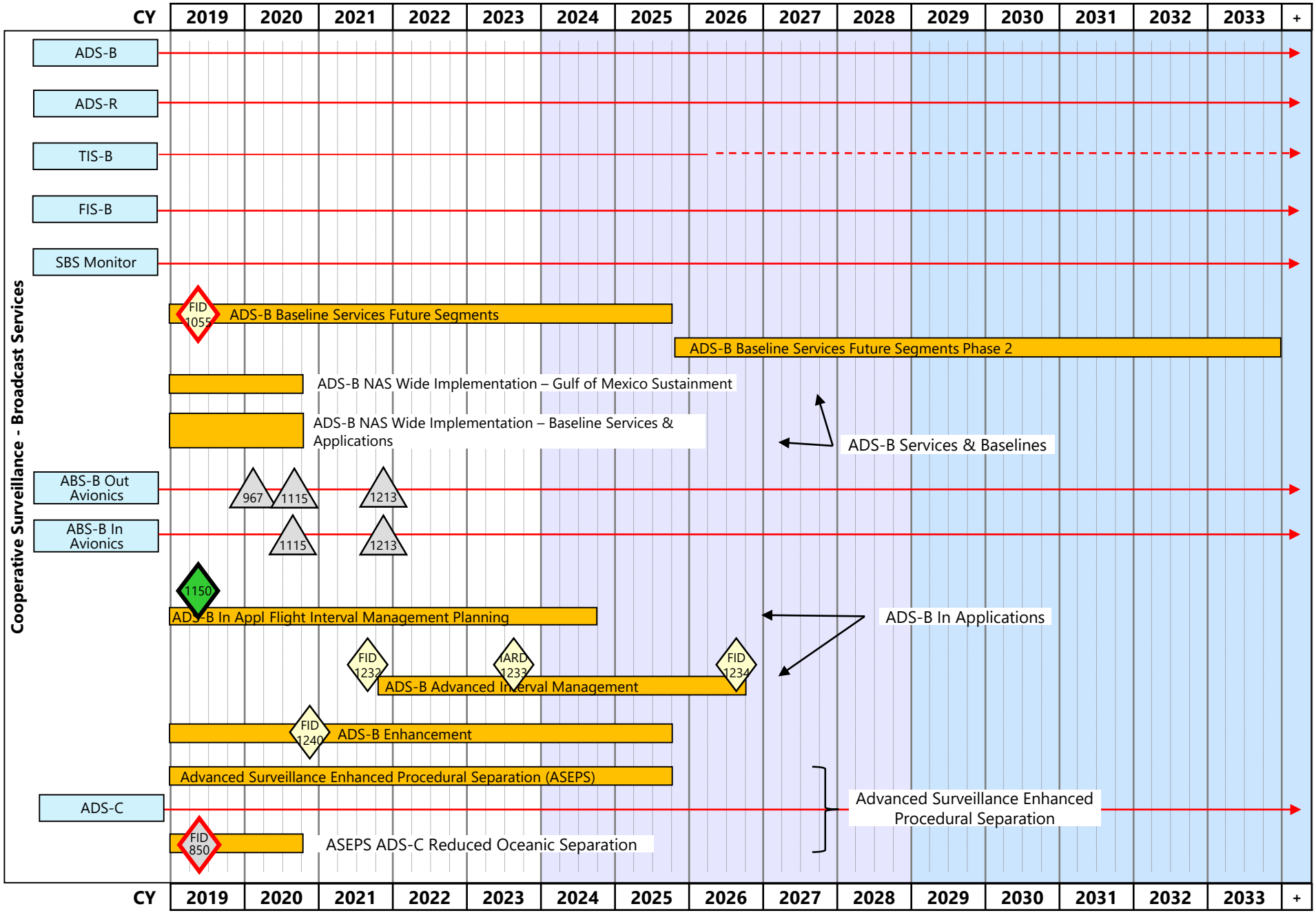
Safety Roadmap: Decision Points (1 of 1)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
988	2021 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Implementation Strategy of Post-Bravo ATC Human Performance Safety Requirements into the NextGen Safety Process
1131	2021 Q1	No	Human Systems Integration	Strategy (Other)	Decision on the Approval and Implementation Strategy of Human Factors System Safety Guidance

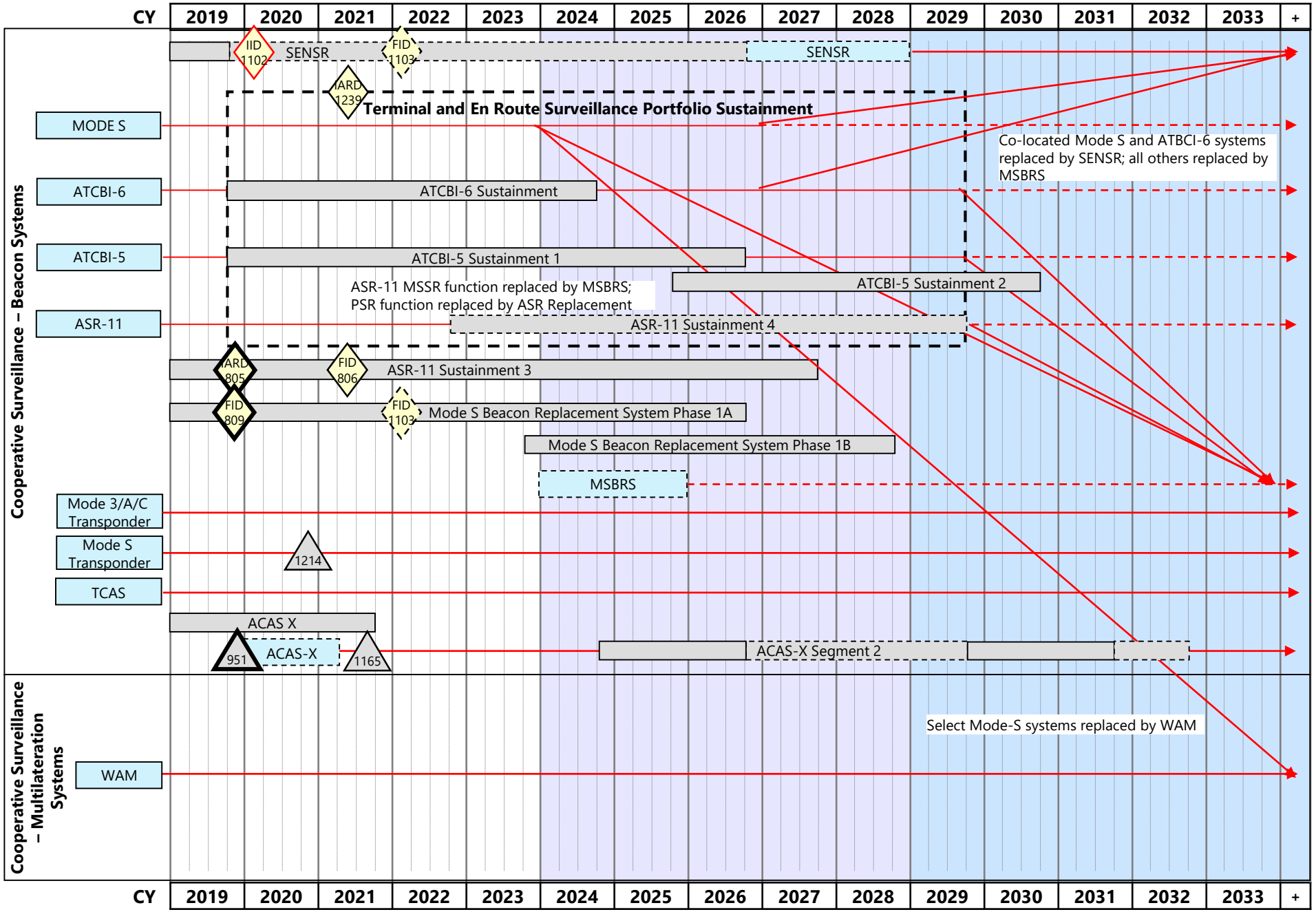
Surveillance

Objective: The Surveillance roadmap depicts the sustainment of legacy surveillance systems and the evolution towards the NextGen environment.

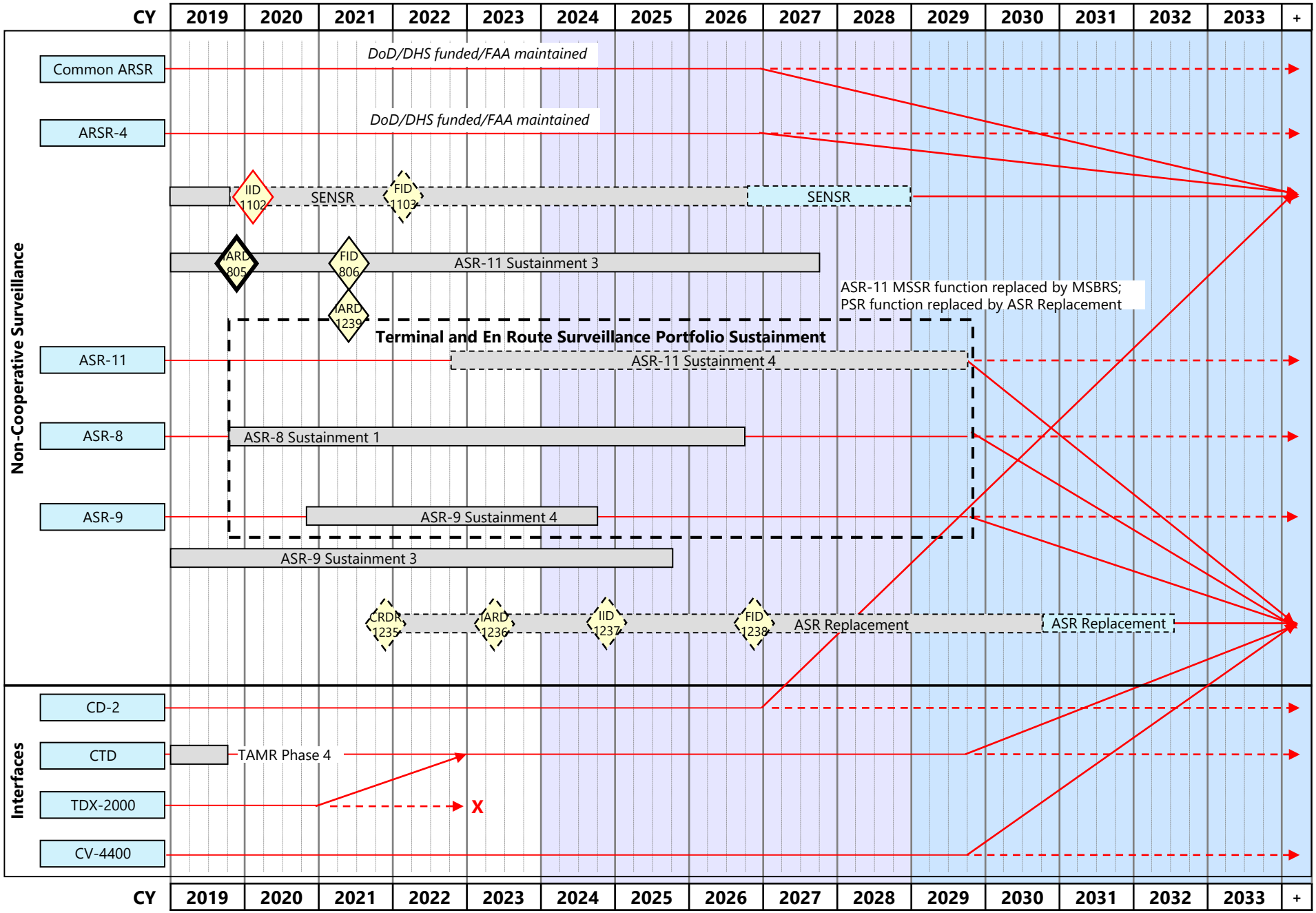
Surveillance Roadmap (1 of 4)



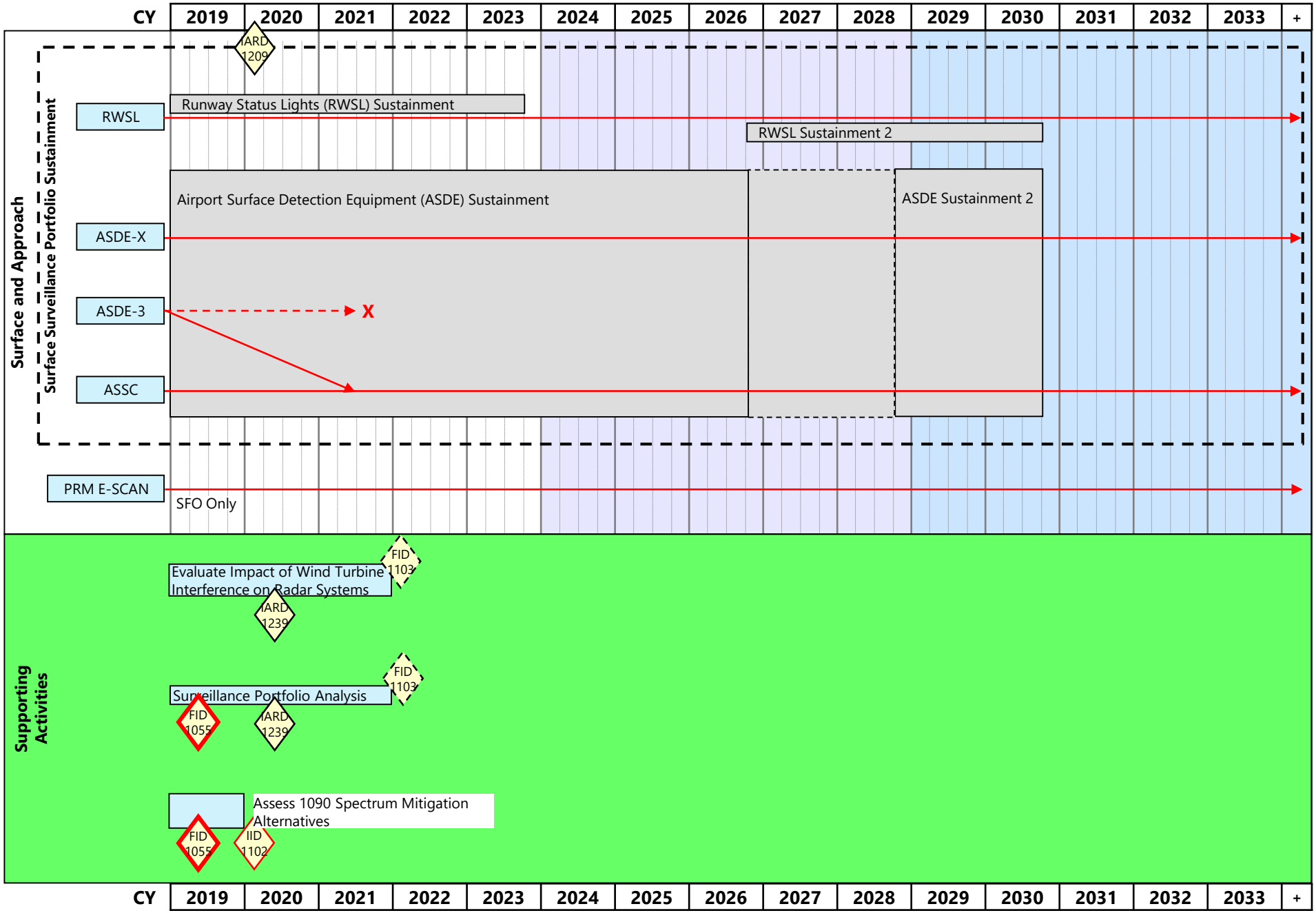
Surveillance Roadmap (2 of 4)



Surveillance Roadmap (3 of 4)



Surveillance Roadmap (4 of 4)



Surveillance Roadmap: Assumptions

Identifier	Description
SURV-01	Backup to mitigate loss of on-board GPS positioning source for ADS-B is required: a) Retain all en route beacons (~150 monopulse systems) b) Retain limited set of terminal beacons (or WAM) based on need (Core 30 airports for resiliency, other airports based on economic analysis and ADS-B equipage rates) c) All terminal non-cooperative surveillance coverage areas are retained for safety purposes d) Selected terminal surveillance systems that will no longer be required will be divested starting in CY2020
SURV-02	a) The Spectrum Efficient National Surveillance Radar (SENSR) will replace the following legacy surveillance systems: 1) ARSR-4 and CARSR-non-cooperative surveillance systems 2) En route ATCBI-6 and Mode S cooperative surveillance systems b) SENSR will NOT replace any other surveillance system c) SENSR will NOT impact the provision of any ADS-B related service (ADS-B, ADS-R, TIS-B, FIS-B) d) The scope of the SENSR program may change, at which point the roadmaps will be updated accordingly
SURV-03	The Mode-S Beacon Replacement System (MSBRS) will replace all remaining beacon systems (including the MSSR portion of ASR-11) that are not replaced by SENSR or WAM
SURV-04	The ASR Replacement system will replace all remaining ASR-8, ASR-9, and ASR-11 (PSR portion) systems

Surveillance Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
805	2019 Q4	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for ASR-11 Sustainment 3
806	2021 Q2	No	Surveillance	FID	Final Investment Decision (FID) for ASR-11 Sustainment 3
809	2019 Q4	No	Surveillance	FID	Final Investment Decision (FID) for Mode Select (Mode S) Sustainment 3
850	2019 Q2	Yes	Automation	FID	Final Investment Decision (FID) for ATOP Enhancement 1
951	2019 Q4	No	Aircraft	Regulatory Milestone	TSO ACAS-Xa/Xo
967	2020 Q1	No	Aircraft	Regulatory Milestone	ADS-B Out Equipage Rule Implemented
1055	2019 Q2	Yes	Surveillance	FID	Final Investment Decision (FID) for ADS-B Baseline Services Future Segments
1102	2020 Q1	Yes	Surveillance	IID	Initial Investment Decision (IID) for SENSR
1103	2022 Q1	No	Surveillance	FID	Final Investment Decision (FID) for SENSR
1115	2020 Q3	No	Aircraft	Regulatory Milestone	Revisions to ADS-B 1090ES MOPS
1150	2019 Q2	No	Surveillance	Strategy (JRC)	Strategy Decision for ADS-B In Applications: Advanced Interval Management (A-IM)
1165	2021 Q3	No	Aircraft	Regulatory Milestone	TSO ACAS-Xu
1209	2020 Q1	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for Surface Surveillance Portfolio Sustainment 1
1213	2021 Q4	No	Aircraft	Regulatory Milestone	Revisions to ADS-B UAT MOPS
1214	2020 Q4	No	Aircraft	Regulatory Milestone	Revisions to Mode S Transponder MOPS
1232	2021 Q3	No	Surveillance	FID	Final Investment Decision (FID) for ADS-B In Applications: A-IM Phase A
1233	2023 Q3	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for ADS-B In Applications: A-IM Phase B
1234	2026 Q3	No	Surveillance	FID	Final Investment Decision (FID) for ADS-B In Applications: A-IM Phase B

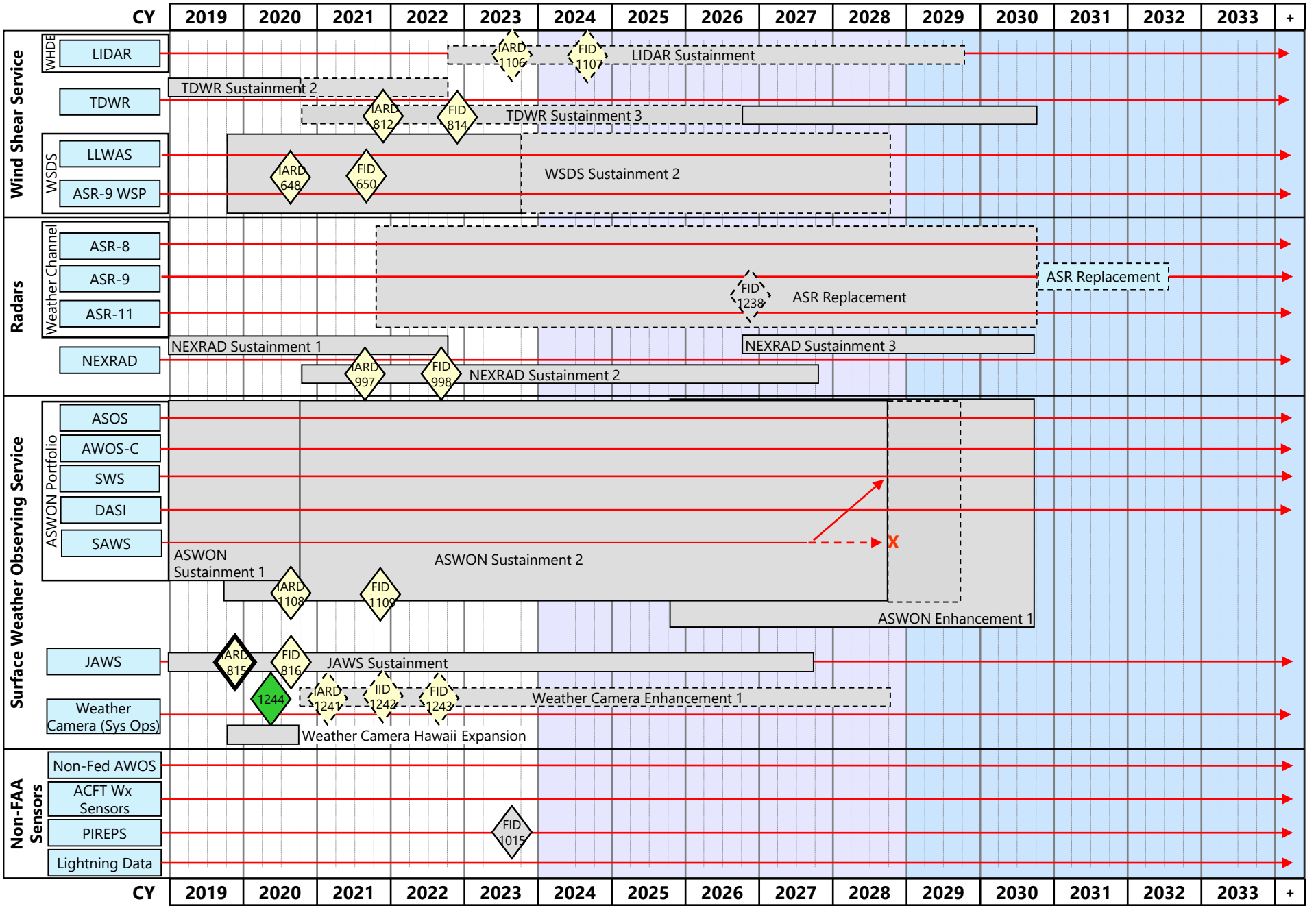
Surveillance Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1235	2021 Q4	No	Surveillance	CRDR	Concept and Requirements Definition Readiness (CRDR) for ASR Replacement
1236	2023 Q2	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for ASR Replacement
1237	2024 Q4	No	Surveillance	IID	Investment Initial Decision (IID) for ASR Replacement
1238	2026 Q4	No	Surveillance	FID	Final Investment Decision (FID) for ASR Replacement
1239	2021 Q2	No	Surveillance	IARD	Investment Analysis Readiness Decision (IARD) for Terminal and En Route Portfolio Sustainment
1240	2020 Q4	No	Surveillance	FID	Final Investment Decision (FID) for ADS-B Enhancement

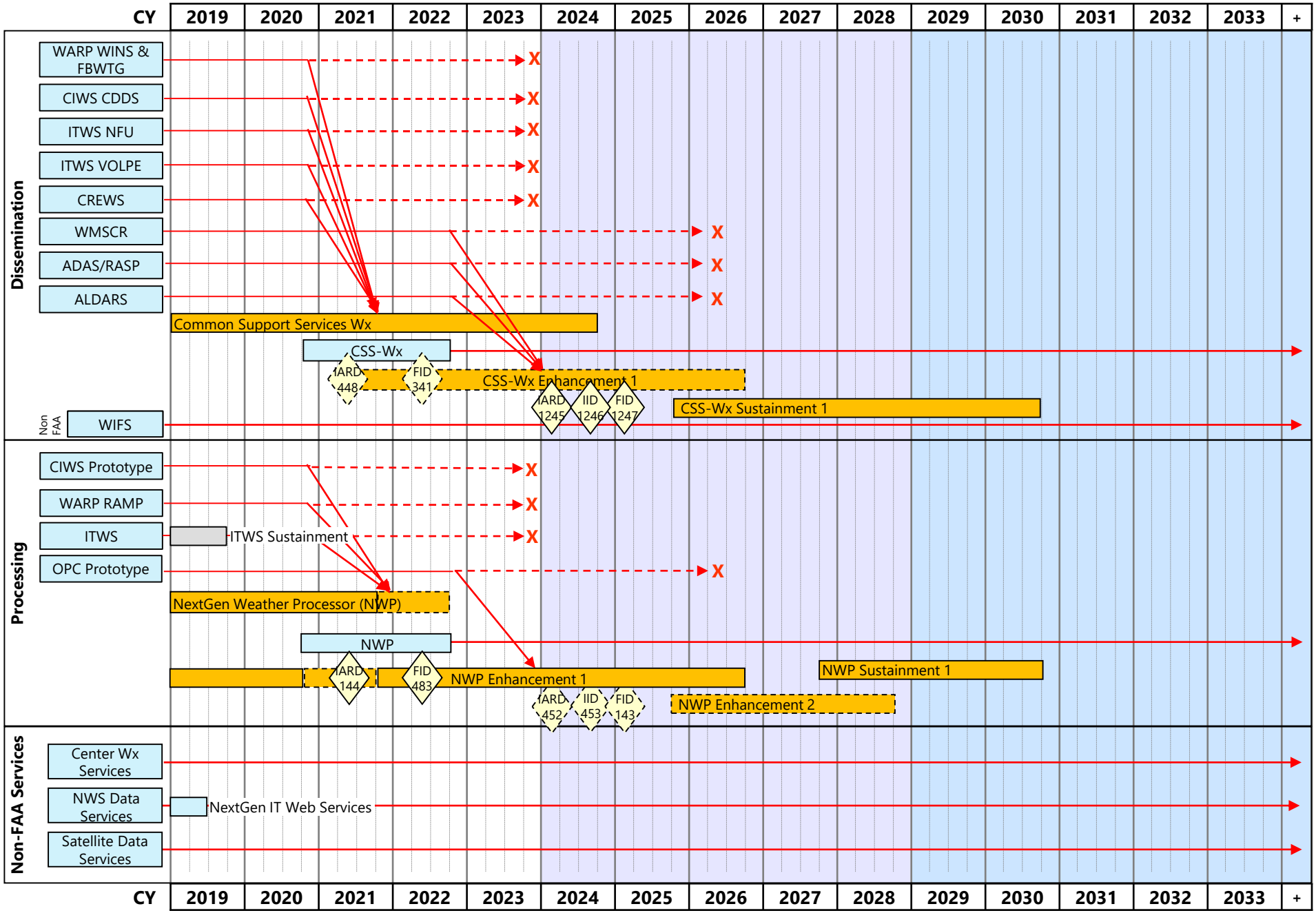
Weather

Objective: The Weather Roadmap presents an Executive View (EV) of weather-related acquisition activities and the changes to these activities that exist within the Weather enterprise architecture (EA) domain (projects and programs) of the Federal Aviation Administration (FAA). The Weather Roadmap provides the evolution of the weather architecture via AMS milestones and related activities (e.g., aviation weather research, demonstrations, and other agency activities) necessary to achieve the performance objectives and capabilities to support NextGen. As a perspective of the changes in the NAS operational environment, the Weather Roadmap reflects major Weather interdependencies to support (or be supported by) other domains in the NAS enterprise architecture as depicted in NAS Roadmaps.

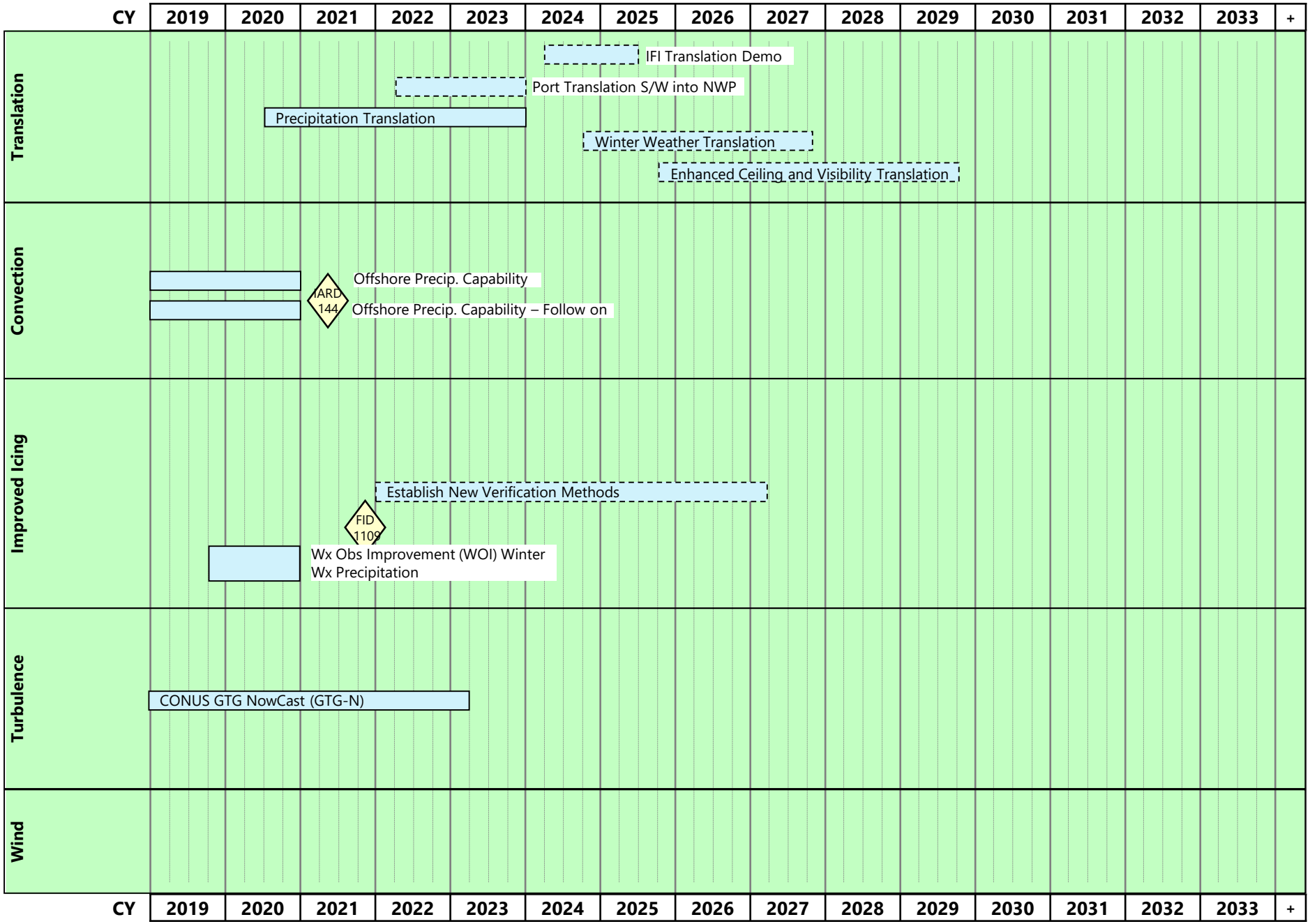
Weather Roadmap (1 of 4)



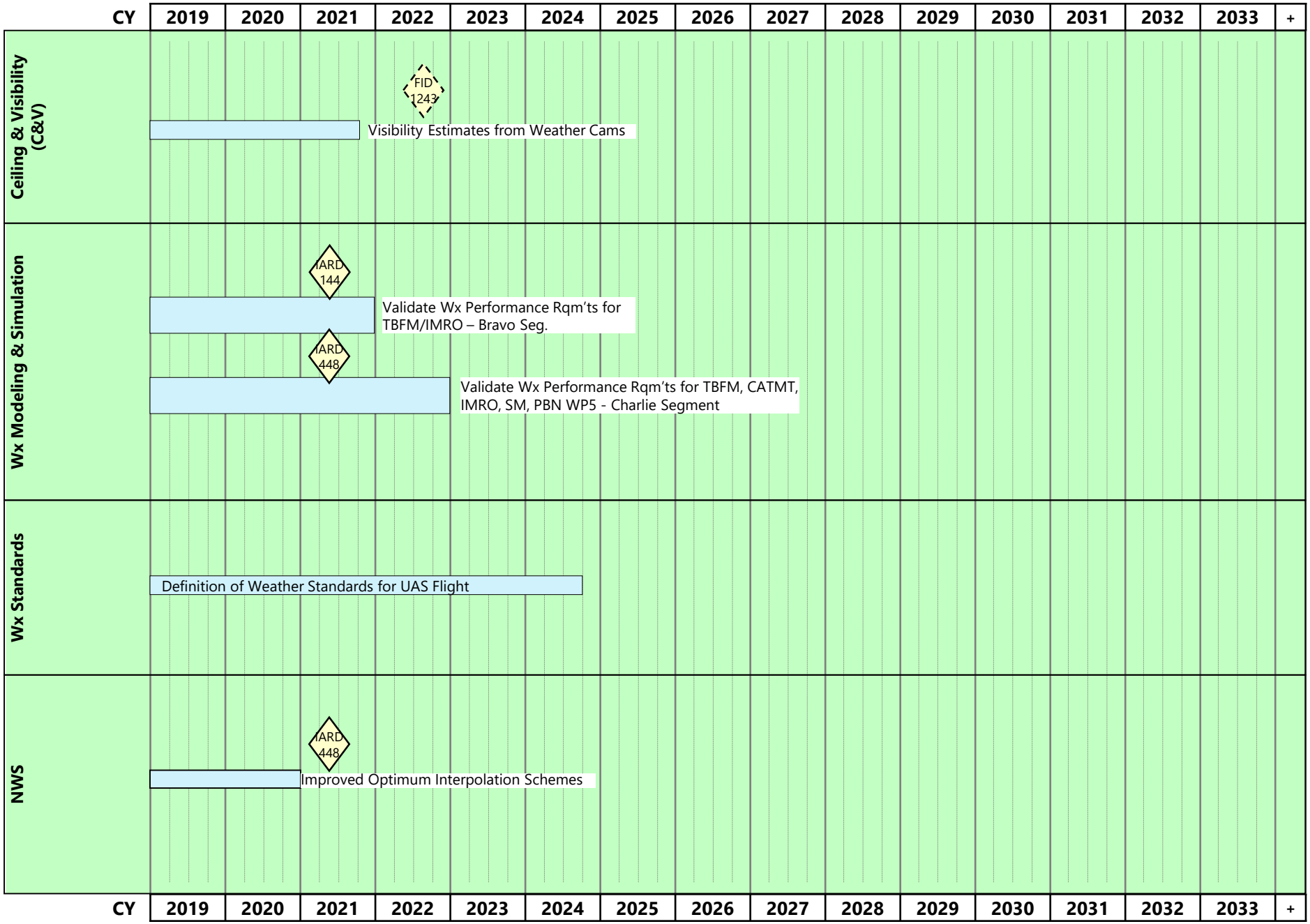
Weather Roadmap (2 of 4)



Weather Roadmap (3 of 4)



Weather Roadmap (4 of 4)



Weather Roadmap: Assumptions (1 of 3)

Identifier	Description
WX-01	Ongoing NextGen (NG) Weather functional & performance requirements validation may result in new/emerging requirements in NextGen Weather Architecture.
WX-02	FAA Terminal Weather Sensor 'Sustainment' divides into four functional divisions: A) weather radar, B) Wind Shear Detection Systems (WSDS), C) Automated Surface Weather Observing Systems (ASWON), and D) other. A) includes TDWR, which will require a future Sustainment 3 work package and far future sustainment. B) WSDS Sustainment 2 addresses LLWAS and WSP obsolescence issues to allow sustainment beyond 2030. C) Includes the ASWON Portfolio which has been standardized into ASOS / AWOS-C / SWS. Decommissioned are all legacy AWOS, AWSS, WEF, and C&G DASI systems via the ASWON Sustainment Program. The follow-on ASWON Sustainment 2 Program will address future obsolescence of the ASWON portfolio systems to allow sustainment beyond 2030. D) Includes both JAWS (turbulence detection) and LIDAR (dry microburst detection) systems that exist as unique systems at single airports. LIDAR is O&M funded.
WX-03	1) ADAS-Rehost serves as a consolidating access point for Weather observations for CSS-Wx Enhancement 1. 2) WMSCR communications functionality and ADAS RASP, including ALDARS functionality, as well as WIFS, to be subsumed by CSS-Wx Enhancement 1.
WX-05	The NAS Weather Infrastructure Portfolio incorporates R&D Research to Ops (RTO) with new weather products/information with increased forecast accuracy/frequency to NAS Users with minimal architectural/infrastructure change. Moreover, RTO Support Activities will further augment support to NAS operational decision-making by including weather “translation” as well as “uncertainty” capabilities.

Weather Roadmap: Assumptions (2 of 3)

Identifier	Description
WX-06	Weather processing functions converge into NextGen Weather Processor (NWP). NWP will be implemented in several Enhancements. Initial NWP implementation (formerly called NWP WP1) provides both NWP-Terminal and NWP-Central services. NWP Enhancement 1 (formerly NWP WP2) replaces prototype CIWS functions including 0-2 hour weather capability and 2-8 hour convective (CoSPA) capability. The Weather and Radar Processor (WARP) Radar Acquisition and Mosaic Processor (RAMP) function is subsumed in initial NWP implementation, as are those of ITWS. NWP Enhancement 2 (formerly NWP WP 3) hosts Wx R&D algorithms matured since initial implementation baseline freeze including improved Convective and Translation algorithms. NWP Enhancement 3 will implement NextGen weather Far-term capabilities.
WX-08	NAS Infrastructure Portfolio will supply weather information to users at user-specified resolution, both spatially and temporally. NextGen Weather Processor (NWP) will host the first NextGen mid-term "weather translation" product, e.g., Weather Avoidance Fields (WAF) convective weather constraints to aircraft movement in NAS airspace, which will be delivered by CSS-Wx. WAFs may be machine-translated into NAS operational impacts by User DSTs. NWP Enhancement 1 and Enhancement 2 will add additional weather translation products e.g. Turbulence, Wind, Ceiling, Visibility, and Precipitation.
WX-09	Products developed from requirements allocated to NWS, will be accessible via CSS-Wx Enhancement 1/Enhancement 2 as they become operational.
WX-10	To address emerging anti-icing regulations and to mitigate automated surface observing shortfalls at Level A/B airports, FAA will continue to evaluate R&D opportunities in sensor and algorithm development to improve precipitation discrimination (freezing/frozen/liquid including ice pellets and drizzle). Once mature and tested to meet all FAA automated sensor requirements, in conjunction with NWS this capability will be integrated into ASOS/AWOS-C to support aircraft and airport ground anti/de-icing operations.
WX-11	Weather observation/forecast R&D will continue to be periodically evaluated for maturity to determine whether new/improved functionality should be implemented.

Weather Roadmap: Assumptions (3 of 3)

Identifier	Description
WX-12	FAA will transmit validated Weather Forecast Performance Requirements to NWS within nine months of having successfully completed associated supporting activity and validation in Wx Modeling & Simulation. When FAA requirements are finalized and allocated to NWS, if NWS doesn't have the current capability to meet the requirement for weather forecasts (e.g., icing, convection, or C&V), FAA R&D funding will be provided to develop algorithms to fulfill those requirements for subsequent implementation by NWS.
WX-13	The SENSR Executive Steering Group down-scoped the SENSR Program by removing all FAA Short-Range ATC Weather, FAA Terminal Weather, and NOAA / NWS Long-Range Weather requirements prior to IID (Surveillance Roadmap DP 1102). SENSR will NOT replace NEXRAD, TDWR, ASRs, or WSP (a WSDS provider). SENSR links can be removed from the Weather Roadmap. SENSR remains a surveillance-only program with priority DOD and DHS, non-cooperative surveillance missions, that will replace some long-range radars. SENSR may (or may not) replace the legacy ARSR-4 weather channel. SENSR could output ASTERIX format weather that could pass-through to consumers such as ERAM. Since SENSR no longer replaces ASRs or any weather systems, no further Weather Roadmap link exists. ASR-8, ASR-9, and ASR-11 will be sustained via a different program and will remain on the weather Roadmap. This includes a separate ASR-9 WSP line for the wind shear detection capability.
WX-14	New imagery channels, sounding data, and lightning data from Satellite Data Services will be baselined between 2017 Q3 and 2021 Q2. Requirements need to be identified and research conducted on integrating new weather satellite sensor data into FAA systems
WX-15	ADS-Wx data (becoming available in 2022), a component of ADS-B v3 data stream provided by the SBS network, will be distributed by CSS-WX along with data from other weather sources in providing comprehensive weather information to its NAS Users.

Weather Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
143	2025 Q1	No	Weather	FID	Final Investment Decision (FID) for NWP Enhancement 2
144	2021 Q2	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for NWP Enhancement 1
341	2022 Q2	No	Weather	FID	Final Investment Decision (FID) for CSS-Wx Enhancement 1 and transition of ADAS communications (and WMSCR Comms if not completed in CSS-Wx) to CSS-Wx Enhancement 1
448	2021 Q2	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for CSS-Wx Enhancement 1 and transition of ADAS and WMSCR Comms to CSS-Wx Enhancement 1
452	2024 Q1	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for NWP Enhancement 2
453	2024 Q3	No	Weather	IID	Initial Investment Decision (IID) for NWP Enhancement 2
483	2022 Q2	No	Weather	FID	Final Investment Decision (FID) for NWP Enhancement 1
648	2020 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for WSDS Sustainment
650	2021 Q3	No	Weather	FID	Final Investment Decision (FID) for WSDS Sustainment
812	2021 Q4	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for TDWR Sustainment 3
814	2022 Q4	No	Weather	FID	Final Investment Decision (FID) for TDWR Sustainment 3
815	2019 Q4	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for JAWS Sustainment
816	2020 Q3	No	Weather	FID	Final Investment Decision (FID) for JAWS Sustainment
997	2021 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for NEXRAD Sustainment 2
998	2022 Q3	No	Weather	FID	Final Investment Decision (FID) for NEXRAD Sustainment 2
1015	2023 Q3	No	Automation	FID	Final Investment Decision (FID) for ERAM Enhancement 3
1106	2023 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for LIDAR Sustainment
1107	2024 Q3	No	Weather	FID	Final Investment Decision (FID) for LIDAR Sustainment
1108	2020 Q3	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for ASWON Sustainment 2
1109	2021 Q4	No	Weather	FID	Final Investment Decision (FID) for ASWON Sustainment 2

Weather Roadmap: Decision Points (2 of 2)

DP #	Target Date CY	High Priority	Primary Domain	Type	Name
1238	2026 Q4	No	Surveillance	FID	Final Investment Decision (FID) for ASR Replacement
1241	2021 Q1	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) for Weather Camera Enhancement 1
1242	2021 Q4	No	Weather	IID	Initial Investment Decision (IARD) for Weather Camera Enhancement 1
1243	2022 Q3	No	Weather	FID	Final Investment Decision (FID) for Weather Camera Enhancement 1
1244	2020 Q2	No	Weather	Strategy (JRC)	Aviation weather cameras expansion to Hawaii and Colorado
1245	2024 Q1	No	Weather	IARD	Investment Analysis Readiness Decision (IARD) from CSS-Wx Sustainment 1
1246	2024 Q3	No	Weather	IID	Initial Investment Decision (IID) from CSS-Wx Sustainment 1
1247	2025 Q1	No	Weather	FID	Final Investment Decision (FID) from CSS-Wx Sustainment 1

Appendix A
Acronym List

Appendix A, Acronym List (1 of 6)

Acronym	Definition	Acronym	Definition
4D	Four dimensional (x, y, z, t)	**ANICS**	Alaska NAS Interfacility Communication System
AC	Advisory Circular	**ANSP**	Air Navigation Service Provider
ACARS	Addressing, Communicating, and Reporting System	**AOC**	Airline Operations Center
ACAS	Airborne Collision Avoidance System	**APNT**	Alternative Positioning, Navigation, and Timing
ACE-IDS	ASOS Controller Equipment-Information Display System	**APWS**	AeroNav Products Workflow System
ACI	Aircraft Cybersecurity Initiative	**ARMT**	Airport Resource Management Tool
ACL	Airport Cable Loop	**ARSR**	Air Route Surveillance Radar
ACS	Aeronautical Common Service	**ARTCC**	Air Route Traffic Control Center
ACFT	Aircraft	**ARTS**	Automated Radar Terminal System
ADAS	AWOS Data Acquisition System	**ASAT**	Airspace Simulation and Analysis for Terminal Procedures
ADF	Automatic Direction Finder	**ASDE**	Airport Surface Detection Equipment
ADS-B	Automatic Dependent Surveillance-Broadcast	**ASEPS**	Advanced Surveillance Enhanced Procedural Separation
ADS-C	Automatic Dependent Surveillance-Contract	**ASOS**	Automated Surface Observing System
ADS-R	Automatic Dependent Surveillance-Rebroadcast	**ASR**	Airport Surveillance Radar
AEFS	Advanced Electronic Flight Strips	**ASSC**	Airport Surface Surveillance Capability
AF	Airway Facility	**ASTI**	Alaska Satellite Telecommunications Infrastructure
AFSM	Alaska Flight Service Modernization	**ASWON**	Aviation Surface Weather Observation Network
AFSS	Automated Flight Service Station	**ATC**	Air Traffic Control
A/G	Air-to-Ground	**ATCBI**	Air Traffic Control Beacon Interrogator
AGIS	Airports Geographic Information System	**ATCSCC**	David J. Hurley Air Traffic Control System Command Center
AHA	Aircraft Hazard Area	**ATCT**	Airport Traffic Control Tower
AIM	Aeronautical Information Management	**ATIS**	Automated Terminal Information System
AirNav	Airport and Navigational Aids Database	**ATM**	Air Traffic Management
AISR	Aeronautical Information System Replacement	**ATO**	Air Traffic Organization (FAA)
ALDARS	Automated Lightning Detection and Reporting System	**ATOP**	Advanced Technologies and Oceanic Procedures
ALS	Approach Lighting System	**AW**	Airworthiness
ALSIP	Approach Lighting System Improvement Program	**AWCS**	Airport Wireless Communications Systems
AMASS	Airport Movement Area Safety System	**AWOS**	Automated Weather Observing System
AMMS	Automated Maintenance Management System	**BCD**	Baseline Change Decision
AMS	Acquisition Management System	**BUEC**	Backup Emergency Communications

Appendix A, Acronym List (2 of 6)

Acronym	Definition	Acronym	Definition
BVLOS	Beyond Visual Line of Sight	**DC**	Data Communications or DataComm
BWM	Bandwidth Manager	**DCNS**	Data Communication Network System
C2	Command and Control	**DHS**	Department of Homeland Security
C&V	Ceiling & Visibility	**DME**	Distance Measuring Equipment
CAEG	Computer-Aided Engineering Graphics	**DMN**	Data Multiplexing Network
CARF	Central Altitude Reservation Function	**DoD**	Department of Defense
CAT	Category	**DOTS+**	Dynamic Ocean Track System Plus
CATMT	Collaborative Air Traffic Management Technologies	**DP**	Decision Point
CCF	Combined Control Facility	**DSP**	Departure Spacing Program
CCS	Conference Control System	**DUATS**	Direct User Access Terminal Service
CD	Common Digitizer	**DVARS**	Data, Visualization, Analysis, and Reporting System
CDM NET	Collaborative Decision-Making Network	**EA**	Enterprise Architecture
CDTI	Cockpit Display of Traffic Information	**ECG**	En Route Communications Gateway
CFE	Communication Facilities Enhancement	**EDDS**	ERAM Data Distribution System
CIP	Capital Investment Plan	**EDMS**	Electronic Document Management System
CIWS	Corridor Integrated Weather System	**EFB**	Electronic Flight Bag
CONOPS	Concept of Operations	**EFSTS**	Electronic Flight Strip Transfer System
CONUS	Conterminous United States	**EFVS**	Enhanced Flight Vision System
CRDR	Concepts and Requirements Definition Readiness	**E-IDS**	Enterprise Information Display System
CS	Commercial Space	**ELT**	Emergency Locator Transmitter
CSPR	Closely Spaced Parallel Runways	**ELVO**	Enhanced Low Visibility Operations
CSS-Wx	Common Support Services-Weather	**ERAM**	En Route Automation Modernization
CTD	Common Terminal Digitizer	**ERIDS**	En Route Information Display System
CTS	Coded Time Source	**ETR**	Emergency Transceiver
CY	Calendar Year	**ETVS**	Enhanced Terminal Voice Switch
DAA	Detect and Avoid	**EWD**	Enhanced WINS Dissemination
DADS	Digital Aeronautics Database System	**FAA**	Federal Aviation Administration
DALR	Digital Audio Legal Recorder	**FANS**	Future Air Navigation System
DASI	Digital Altimeter Setting Indicator	**FBWTG**	FAA Bulk Weather Telecommunications Gateway
DBRITE	Digital Bright Radar Indicator Tower Equipment	**FCS**	FAA Cloud Service

Appendix A, Acronym List (3 of 6)

Acronym	Definition	Acronym	Definition
FDIO	Flight Data Input/Output	**IDS**	Information Display System
FDPS	Flight Data Processing System	**IESP**	Integrated Enterprise Services Platform
FFS	Future Flight Services	**IFIA**	International Flight Inspection Aircraft
FID	Final Investment Decision	**IFPA**	Instrument Flight Procedure Automation
FIM	Flight Interval Management	**IFR**	Instrument Flight Rules
FIP	Forecast Icing Product	**IID**	Initial Investment Decision
FIS-B	Flight Information Service-Broadcast	**ILS**	Instrument Landing System
FMS	Flight Management System	**INM**	Integrated Noise Model
FNS	Federal NOTAM System	**IOC**	Initial Operating Capability
FOC	Full Operational Capability	**IP**	Internet Protocol
FOMS	Flight Operations Management System	**IPDS**	Instrument Procedure Development System
FPPS	Facility Power Panel Schedule	**IRU**	Inertial Reference Unit
FSRM	Facility Security Risk Management	**ISAM**	Integrated Safety Assessment Model
FSS	Flight Service Station	**ISD**	In-Service Decision
FTI	FAA Telecommunications Infrastructure	**ISS**	Information Systems Security
FY	Fiscal Year	**ITWS**	Integrated Terminal Weather System
GA	General Aviation	**IVSR**	Interim Voice Switch Replacement
GBAS	Ground-Based Augmentation System	**JAWS**	Juneau Airport Wind System
GNSS	Global Navigation Satellite System	**JRC**	Joint Resources Council
GPS	Global Positioning System	**L5**	A third civil signal on Navstar GPS (1176.45 MHz)
HFDL	High Frequency Data Link	**LAANC**	Low Altitude Authorization and Notification Capability
HSI	Human/Systems Integration	**LDIN**	Lead In Light System
HUD	Head-Up Display	**LDRCL**	Low-Density Radio Communications Link
H/W	Hardware	**LED**	Light-Emitting Diode
IAM	Identity Access Management	**LIDAR**	Laser Identification Detection and Ranging
IARD	Investment Analysis Readiness Decision	**LLWAS**	Low-Level Windshear Alert System
ICAO	International Civil Aviation Organization	**LOC**	Localizer
ICMS	Integrated Control and Monitoring System	**LOS**	Line of Sight
ICSS	Integrated Communications Switching System	**LP/HP**	Low Power/High Power

Appendix A, Acronym List (4 of 6)

Acronym	Definition	Acronym	Definition
LRR	Long Range Radar	**NGSS**	Next Generation Satellite System
LVO	Launch Vehicle Operations	**NIDS**	NAS Information Display System
MAMP	Mobile Asset Management Program	**NIEC**	NextGen Integration and Evaluation Capability
MASPS	Minimum Aviation System Performance Standards (RTCA)	**NME**	NAVAIDs Monitoring Equipment
MASR	Mobile Airport Surveillance Radar	**NMR**	NADIN MSN Rehost
MB	Marker Beacon	**NNCC**	National Network Control Center
MDCRS	Meteorological Data Collection and Reporting System	**NOAA**	National Oceanic and Atmospheric Administration
MDR	Multi-Mode Digital Radios	**NOCC**	National Operations Control Center
MEARTS	Microprocessor En Route Automated Radar Tracking System	**NOP**	National Offload Program
MMAC	Mike Monroney Aeronautical Center	**NOTAM**	Notice to Airmen
MODE S	Mode Select	**NSWRC**	NextGen Surveillance and Weather Capability
MOPS	Minimum Operational Performance Standards (RTCA)	**NVR**	NAS Voice Recorder
MPAR	Multi-Function Phased-Array Radar	**NVS**	National Airspace System Voice Switch
NACGS	National Aeronautical Charting Group System	**NWP**	NextGen Weather Processor
NADIN MSN	National Airspace Data Interchange Network Message Switched Network	**NWS**	National Weather Service
NADIN PSN	National Airspace Data Interchange Network Packet Switched Network	**OARS**	Operational Analysis and Reporting System
NAIMES	NAS Aeronautical Information Management Enterprise Systems	**OASIS**	Operational and Supportability Implementation System
NAS	National Airspace System	**Obs**	Observation
NASA	National Aeronautics and Space Administration	**OCC**	Operations Control Center
NASE	NAS Adaptation Services Environment	**ODALS**	Omnidirectional Approach Lighting System
NASR	National Airspace System Resource	**OEAAA**	Obstruction Evaluation/Airport Airspace Analysis
NAVAID	Navigational Aid	**OFDPS**	Offshore Flight Data Processing System
NBSC	NextGen Backup Surveillance Capability	**OI**	Operational Improvement
NCR	NAS Common Reference	**OPC**	Offshore Precipitation Capability
NDB	Non-Directional Beacon	**Ops**	Operations
NEMC	Network Enterprise Management Center	**OPSNET**	Operations Network
NEMS	NAS Enterprise Messaging Service	**ORS**	Obstacle Repository System
NEXCOM	Next-Generation VHF A/G Communication System	**PAPI**	Precision Approach Path Indicator
NEXRAD	Next Generation Weather Radar	**PBN**	Performance-Based Navigation
NextGen	Next Generation Air Transportation System	**PDARS**	Performance Data Analysis and Reporting System

Appendix A, Acronym List (5 of 6)

Acronym	Definition	Acronym	Definition
Ph.	Phase	**SDI**	Space Data Integrator
PIREPS	Pilot Reports	**SE**	System Engineering
PRM	Precision Runway Monitor	**Segmt.**	Segment
PS3	Power Systems Sustained Support	**SENSR**	Spectrum Efficient National Surveillance Radar
Qn	Calendar Quarter n (n = 1-4)	**SFDPS**	SWIM Flight Data Publication Service
R&D	Research & Development	**SLEP**	Service Life Extension Program
RCE	Radio Control Equipment	**SMA**	Surface Movement Advisor
RCF	Radio Communication Facility	**SMGCS**	Surface Movement Guidance and Control System
RCL	Radio Communications Link	**SOA**	Service Oriented Architecture
RCOM	NAS Recovery Communications	**SOCC**	Security Operations Control Center
RDVS	Rapid Deployment Voice Switch	**SSMT**	System Safety Management Transformation
REIL	Runway End Identifier Lights	**STARS**	Standard Terminal Automation Replacement System
RMLS	Remote Maintenance and Logging System	**STDDS**	SWIM Terminal Data Distribution System
Rn	Release n (n = 1, 2,…N)	**STVS**	Small Tower Voice Switch
RNAV	Area Navigation	**Svc.**	Service
RNP	Required Navigation Performance	**SVGS**	Synthetic Vision Guidance System
RSA	Runway Safety Area	**SVO**	Space Vehicle Operations
RTCA	Radio Technical Committee for Aeronautics	**SVS**	Synthetic Vision System
RV	Re-entry Vehicle	**S/W**	Software
RVR	Runway Visual Range	**SWIM**	System-Wide Information Management
RVSM	Reduced Vertical Separation Minima	**SWS**	Surface Weather System
RWSL	Runway Status Lights	**TACAN**	Tactical Air Navigation
SAA	Special Activity Airspace	**TAMR**	Terminal Automation Modernization and Replacement
SAMS	Special Use Airspace Management System	**TARGETS**	Terminal Area Route Generation Evaluation and Traffic Simulation
SATCOM	Satellite Communication Network	**TAWS**	Terrain Awareness and Warning System
SAWS	Stand-Alone Weather Sensor	**TBFM**	Time-Based Flow Management
SBAS	Satellite-Based Augmentation System	**TBO**	Trajectory-Based Operations
SBS	Surveillance and Broadcast Services	**TCAS**	Traffic Alert and Collision Avoidance System
SCT	Safety Collaboration Team	**TCF**	Terminal Convective Forecast
SDAT	Sector Design and Analysis Tool	**TDLS**	Tower Data Link Services

Appendix A, Acronym List (6 of 6)

Acronym	Definition	Acronym	Definition
TDM	Time-Division Multiplexing	**VoIP**	Voice Over Internet Protocol
TDWR	Terminal Doppler Weather Radar	**VOR**	VHF Omnidirectional Range
TFDM	Terminal Flight Data Manager	**VOR MON**	VOR Minimum Operating Network
TFM	Traffic Flow Management	**VORTAC**	VOR with TACAN
TFM-I	Traffic Flow Management - Infrastructure	**VOT**	VHF Omnidirectional Range Test
TFMS	Traffic Flow Management System	**VSBP**	Voice Switch Bypass
TFR Bldr	Temporary Flight Restriction Builder	**VSCS**	Voice Switching and Control System
TIS-B	Traffic Information Service-Broadcast	**VTABS**	VSCS Training and Backup System
TR	Technology Refresh	**WAAS**	Wide-Area Augmentation System
TRACON	Terminal Radar Approach Control	**WAM**	Wide Area Multilateration
TSO	Technical Standard Orders	**WARP**	Weather and Radar Processor
TVSR	Terminal Voice Switch Replacement	**WEF**	Wind Equipment Series F
TWIP	Terminal Weather Information for Pilots	**WINS**	Weather Information Network Server
UAS	Unmanned Aircraft System	**WJHTC**	William J. Hughes Technical Center (FAA)
UIC	Universal Interlock Controller	**WME**	Wind Measuring Equipment
UIS	Unstaffed Infrastructure Sustainment	**WMS**	WAAS Master Station
URET	User Request Evaluation Tool	**WMSCR**	Weather Message Switching Center Replacement
USNS	United States NOTAM Service	**WPn**	Work Package n (n = 1, 2, …N)
UTM	Unmanned Traffic Management	**WSDS**	Wind Shear Detection Services
VASI	Visual Approach Slope Indicator	**WSP**	Weather System Processor
VHF/UHF/ HF	Very High Frequency/Ultra High Frequency/High Frequency	**WT**	Wake Turbulence
VLOS	Visual Line of Sight	**WTMA**	Wake Turbulence Mitigation for Arrivals
VNAV	Vertical Navigation	**Wx**	Weather

Appendix B
Change History

Aircraft

- Synchronized elements of Surveillance Roadmap with Aircraft Roadmap
- Added representation of the FAA's Minimum Capability List (MCL) for avionics equipage

Airport

- Updated to reflect other roadmap changes

Airspace & Procedures

- Added Commercial Space and UAS lanes (SDI, SIC, sUAS)
- Aligned AIMM lanes with Automation
- Added TBFM lane
- Added Support Activities to reflect Dynamic Separation for Wake Mitigation and PBN/TBM Integrated Design research
- ASEPS and ATOP lanes added

Automation

- Automation programs are adopting Tech Refresh Portfolio:
- Now: TBFM S1, TFMS S3, STARS SP1
    - Soon: ERAM S4
- Offshore Automation re-plan merged Phase 1 & Phase 2
- TFM-I Sustainment waived (cancelled)
- Completed FIDs: AGMG, ATOP E1, FFSP

Communications

- ASTI is processing an ACN (October), moving out FID
- Added NEXCOM Phase 3
  - Replaces MDR VHF and UHF V1 radios with VoIP radios at en-route and necessary terminal sites
- Added SWIM Segment 3
  - Includes new user & concept requirement and increased capacity to support TBO information flows
- Added new support activities that highlight avionic and security initiatives within the communication domain
- Added Legacy Voice Switch Sustainment Portfolio (LVSSP)
  - Portfolio includes Voice Switching and Control System (VSCS), VSCS Training and Backup System (VTABS), Enhanced Terminal Voice Switch (ETVS), Rapid Deployment Voice switch (RDVS), Small Tower Voice Switch (STVS)
- Planned IARD in Q1 (March) 2020
- Completed FIDs: NVR 2019 Q3 (DP 919)

Enterprise Services

- SWIM Cloud Distribution Service (SCDS) deployed
- TFDM Service IOC & FOC updated

Facilities

- Expanded on projects within ATCT/TRACON Replacement
- Completed FIDs: NTES 2019 Q3 (DP 1193)

Human Systems Integration

- Added new strategy non-JRC DP
  - Decision on the Approval and Implementation Strategy of Human Factors Guidelines for Minimum Cockpit Display of Traffic Information (CDTI) Requirements - Dependent Staggered Approaches
  - Due CY21 Q4

Information Systems Security

- Restructured the first page and added activities to align with the Cyber Security Framework (CSF)
- Pushed out Policy DPs for Remote Management and Security Software Management
- Added missing details for Support Activities and color-coded based on performing organization
- Establish Next Phase of Emerging Cyber Capabilities from CyTF TESTING to protect against evolving threats

Navigation

- Update to include NME to reflect upcoming planned work
- Update to GBAS milestones and added SBAS milestones to reflect current work in dual-frequency multi-constellation standards
- Update to ELVO depiction to show work ending in Aug 2019

New Entrants – Commercial Space

- Extended dates for Support Activities:
  - Analytical Improvements for Aircraft Hazard Areas Reduction
  - Operator Planning Portal Assessment
- Added Support Activities:
  - Prognostic Algorithm Design for Safety
  - Space Integration Capabilities for the ATO
  - Conduct an in-depth review of existing policies and regulations to provide recommendations for future changes
  - Launch and Reentry Vehicle Operator Data Standards

New Entrants – UAS

- Added Urban Air Mobility (UAM) swimlane
- Moved out UAS Enhancement 1 DPs via ACN
- Added Support Activities for UAM and UAS Upper Airspace ConOps
- Added Standards Certification and Development Support Activities
  - Remote ID
  - UTM USS to USS Standard
  - ASTM Detect and Avoid Performance Standard

Safety

- Changed representation of OARS to reflect transition from NAS to Mission Support

Surveillance

- Revised the roadmap to reflect re-scoping of the SENSR program
  - Introduced Mode S Beacon Replacement System (MSBRS) and ASR Replacement as successors to the terminal beacon and radar systems no longer within the scope of SENSR
- Reformatted the roadmap based on the latest surveillance strategy and terminology
  - Organized by cooperative surveillance (broadcast services, beacons, and multi-lateration systems), non-cooperative surveillance, interface systems, and surface/approach systems
- Sustainment of the legacy backup surveillance systems (beacons, radars) organized within a Terminal and En Route Surveillance portfolio
- Completed FIDs: ADS-B Baseline Services Future Segs (DP1055)

Weather

- SENSR program scope no longer includes weather radars and WSP. ASR's, including the WSP, will be sustained/enhanced via future ASR Replacement programs. TDWR and NEXRAD will be sustained/enhanced independently.
- CSS-WX:
  - CSS-Wx E1 IARD shifted from Q1 2020 to Q2 2021
  - FID shifted to Q2 2022
  - CSS-Wx system depiction in the roadmap was repositioned to align with anticipated IOC/FOC dates
  - CSS-WX Enhancement 1 CIP funding removed; this is now planned
- NWP:
  - NWP E1 IARD shifted from Q1 2020 to Q2 2021
  - FID shifted to Q2 2022
  - NWP system depiction in the roadmap was repositioned to align with anticipated IOC/FOC dates
- Added new program: Aviation Weather Camera Enhancement 1
- Expanded WSDS, ASR, ASWON portfolios representation to encompass relevant systems